ATLANTIC CITY AREA WETLANDS REVIEW

VOLUME II: BACKGROUND INFORMATION

U.S. ARMY CORPS OF ENGINEERS
PHILADELPHIA DISTRICT, PHILADELPHIA, PA.

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20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This study provides a regional approach tc the regulation of activities affecting the wetlands of greater Atlantic City, New Jersey. Information contained in this review describes the federal permit application review procedures, classifies and indentifies the wetlands of the greater Atlantic City area, provides profiles on the physical, biological, land and water use characteristics of the study area and indicates likely action that the Corps of Engineers would take on permit requests in areas under its jurisdiction. A base line study map is provided of the area.

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ERRATA SHEET

Please note the following modifications of the study's text and figures. The identification of any additional errors would be appreciated.

VOLUME I: OVERVIEW AND CONCLUSIONS

Page xvii, Line 14	"theis" should be "their"
Page xvii, Line 22	"Areas" should be "Area"
Page xvii, Line 33	"the" should be deleted
Page xvii, Line 37	"The" should be "the"
Page 1, Col. 1, para. 1, Line 1	"The" should appear before "Atlantic"
Page 1, Col. 1, para. 2, Lines 1 & 2	"assist planners, developers, and builders submitting" should be "assist those submitting"
Page 1, Col. 2, para. 1, Line 4	"role" should be "roles"
Page 5, Col. 2, para. 4, Line 7	"commercial or large private projects" should be "commercial, private, or government projects"
Page 11, Col. 2, para. 1, Line 13	"defined above" should be removed.
Page 17, Col. 1	"6.2.2 Atlantic City" should be deleted.
Page 17, Col. 1, para. 1, Line 6	"on" should be "of"
Page 22, Col. 2, para. 1, Line 7	"improve" should be "alter"
Page 23, Col. 2, Line 4	"," should be "."
Page 25, Col. 2, para. 3, Line 2	"corps" should be "Corps"
Page 26, Footnote, Line 2	"inpact" should be "impact"
Page 29, Col. 2, para 5, Line 3	"resting" should be "nesting"
Page 38, Figure 2-6, Line 1	"DEFINITION AND ACTIVITY ACCEPTABILITY" should be deleted
Page 40, para. 1, Line 1	"Typically its" should be "Typically, its"
Page 40, para. 1, Line 2	"moorage" should be "mooring"
Page 41, para. 3, Line 5	"the" should be "a"
Page 42, para. 1, Line 2	"of water" should be "of a water"
Page 44, para. 1, Line 2	"moorage" should be "mooring"
Page 47, para. 1, Line 1	"bouys" should be "buoys"
Page 48, para. 1, Line 1	"struture" should be "structure"
Page 49, NOTE, Line 2	"moorage" and "Moorage" should be "mooring" and "Mooring"
Page 50, Figure 2-8, Statement 17	"eroision" should be "erosion"
Page 62, Col. 2, Line 3	"attachment algae" should be "attachment of algae"
Page 64, Col. 2, para. 1, Line 10	"routes" should be "roads"
Page 64, Col. 2, para. 3, Line 20	"stakes" should be "staked"
Page 65, Col. 1, para. 1, Line 16	"diamond backed" should be "diamondback"
Page 66, Col. 1, Line 11	"moorage" should be "mooring"
Page 69, Col. 2, para. 1, Line 1	"moorage" should be "mooring"
Page 71, Footnote, Line 2	"anerobic" should be "anaerobic"
Page 72, Figure 2-31	"Minimum dredging" should be "Minimal dredging"
Page 73, Col. 2, para. 1, Line 5	"Wetland" should be "Wetlands"

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Page vxii, Line 14	"theis" should be "their"
Page xvii, Line 22	"Areas" should be "Area"
Page xvii, Line 33	"the" should be deleted
Page xvii, Line 37	"The" should be "the"
Page 2, Col. 1, para. 2, Line 1	"project" should be "study"
Page 2, Col. 2, para. 1, Line 2	"sandy" should be "study"
Page 8, Col. 2, para. 3, Line 4	"beach" should be "islands"
Page 10, col. 2, para. 1, Line 10	"areas" should be "area's"
Page 10, Col. 2, para. 2, Line 12	"photographs and map interpretation" should be "photographs, map interpretation, and"
Page 12, Col. 1, para. 2, Line 1	"systems" should be deleted
Page 13, Col. 1, para. 2, Line 6	"north" should be "northern"
Page 14, Col. 1, para. 1, Line 1	"currents" should be "current"

Page 14, Col. 2, para. 3, Line 1	a comma should appear after "steep"
Page 14, Col. 2, para. 3, Line 3	"disposition" should be "deposition"
Page 16, Col. 2, para. 1, Lines 8-9	"a number of visible overwash locations, many of which were" should be "one overwash location which was"
Page 26, Col. 1, para. 1, Line 9	A period should appear after life.
Page 28, Col. 1, para. 2, Line 5	A period should follow estuary.
Page 31, Col. 1, para. 1, Line 2	"the" should be "an"
Page 33, Figure 2-4	"Species of Major Ecological Systems" should be "Species of Major Habitat Types"
Page 37, Col. 1, para. 1, Line 7	"sapidu:" should be "sapidus"
Page 37, Col. 1, para. 1, Line 8	"Palasmonetes" should be "Palaemonetes"
Page 39, Figure 2-6	Amphibians are not located typically in salt water areas
Page 39, Col. 2, Line 3	"and windowpane, along with red" should be "windowpane, red"
Page 41, Table 2-3, Col. 2, Line 10	"roasker" should be "croaker"
Page 42, Col. 1, para. 2, Line 1	"varied" should be "varies"
Page 42, Col. 1, para. 4, Line 3	"Fish and Wildlife" should be "Fish, Game, and Wildlife"
Page 44, Table 2-5	"Bafflehead" should be "Bufflehead":"Marganser" should be "Merganser"
Page 45, Col. 1, para. 1, Line 2	"The State" should be "the list of State"
Page 45, Col. 1, para. 1, Line 4	"List" should be deleted
Page 50, Col. 1, para. 4, Line 6	"Atlantic City" should be "study area"
Page 50, Col. 2, para. 2, Line 1	"Location of" should be deleted
Page 50, Col. 2, para. 2, Line 2	"categorized" should be "located"
Page 59, Figure 3-6	In the legend, waters 3'-6' should be light blue
Page 66, Col. 2, Footnote 1	"the activity" should be "that purpose"
Page 72, Table 4-4	"Sewerage" should be "Sewage"
Page 73, Footnote	"responsing" should be "responding"
Page 77, Question xiiia	"wetlands" should be "wetland"
Page 78, Question xivb	A comma should follow with; "sue" should be "use"
Page 79, Col. 1, para. 1, Line 3	"however, undertake" should be "undertake, however"
Page 79, Col. 1, para. 1, Line 4	"closely-related" should not be hyphenated
Page 82, Col. 1, para. 2, Line 7	"permit review" should be "permit application review"
Page 83, Col. 1, para. 1, Line 4	"aquisition" should be "acquisition"
Page 86, Col. 1, para. 3, Line 2	"and refinement" should be deleted
Page 87, Table 5-1, Col. 3, Item 3	"system" should be "systems"

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U.S. ARMY CORPS OF ENGINEERS
PHILADELPHIA DISTRICT, PHILADELPHIA, PA.

ATLANTIC CITY AREA WETLANDS REVIEW

Sponsored By:

January, 1981

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The **ATLANTIC CITY AREA WETLANDS REVIEW** is separated into two volumes. Volume I provides the prospective user with information necessary to understand the Federal permit application review process and with guidance on the formulation, planning and design of proposed projects.

Volume II contains the background information that went into the development of various recommendations contained in Volume I.

ATLANTIC CITY AREA WETLANDS REVIEW

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Chapter 1
PHYSICAL PROFILE

1.1 PURPOSE

The purpose of the Physical Profile is to describe the physical characteristics of the study area. The topics discussed in this chapter include:

- Topography,
- Soil Characteristics,
- Groundwater Resources,
- Surface Water Resources,
- Coastal Processes,
- Estuarine Processes,
- Beach and Nearshore Processes,
- Climate, and
- Effects of Man.

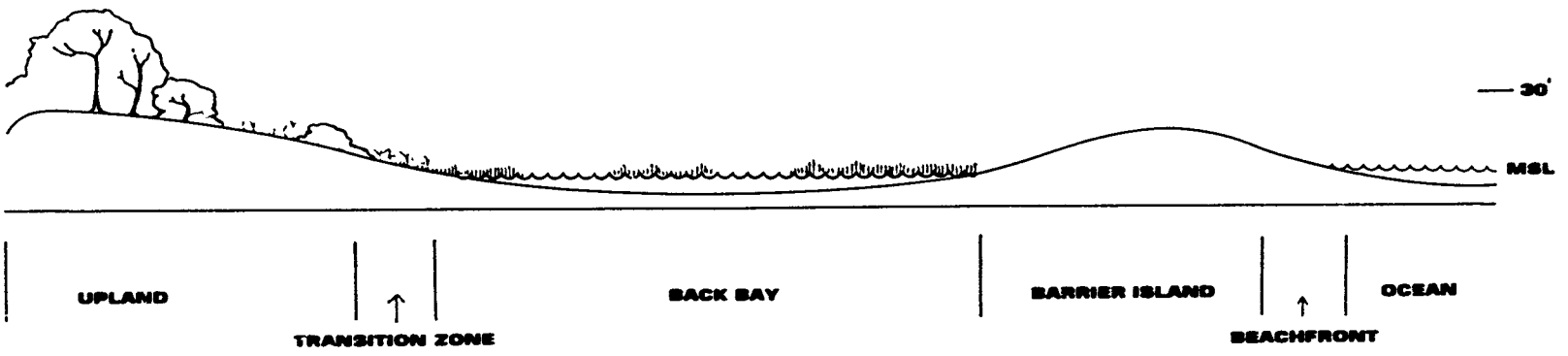
1.2 TOPOGRAPHY

The shape of the study area is elongated in a north-south direction. It has a maximum width of approximately 7 miles and a maximum length of approximately 14 miles. In general terms, the study area comprises four distinct bands. At the easternmost edge is the Atlantic Ocean. The barrier islands form the next band which separates the back bays, the third band, from the ocean. In addition, three inlets connect the back bays to the ocean. The westernmost band is the mainland. Although conditions at any one point may have varied over the years, this pattern has been in existence for a long time.

The land within the boundaries of the study area is essentially flat. Total relief is a maximum of 60 feet with most of the study area lying between 0 and 30 feet above mean sea level. Generally, the barrier islands are less than 20 feet in elevation. The highest elevations within the study area occur along its western boundary. Figure 1-1 presents an idealized cross section of the study area.

There are two stream valleys within the study area, Patcong Creek and Absecon Creek. Patcong Creek extends in a generally north-south direction from the outlet of Bargaintown Pond to its confluence with Great Egg Harbor Inlet. Absecon Creek flows in an east-west direction from the outlet of the Atlantic City Reservoir to its mouth which is located on the western side of Absecon Bay.

On the microscale, changes in elevation occur most rapidly along the beaches of the barrier islands. They also occur rapidly at the entrances of the study area's three oceanic inlets: Great Egg Harbor Inlet between Ocean City and Longport, Absecon Inlet between Atlantic City and Brigantine, and the Brigantine Inlet at the northern edge of the study area. Great Egg Harbor Inlet and Absecon Inlet have been partially stabilized by development. However, significant erosion, deposition of material, and channel movement have occurred at the mouth of Brigantine Inlet.



IDEALIZED TOPOGRAPHIC CROSS SECTION OF THE STUDY AREA **Figure 1-1**

1.2.1 SLOPE HAZARD

Slope hazard may be interpreted as the presence of a slope sufficiently steep to impose development constraints or to preclude building activity. As the total relief within the study area is relatively small, slope hazard on a large scale is nonexistent. On the microscale, however, there are steep slopes that occur on a lot-by-lot basis. In this latter case, the vertical drop, as well as the horizontal distance over which the slope occurs, are sufficiently small that building constraints should be based on inspection of the individual construction site.

1.2.2 SOIL CHARACTERISTICS

The Soil Conservation Service groups soils of the project area into four major associations:

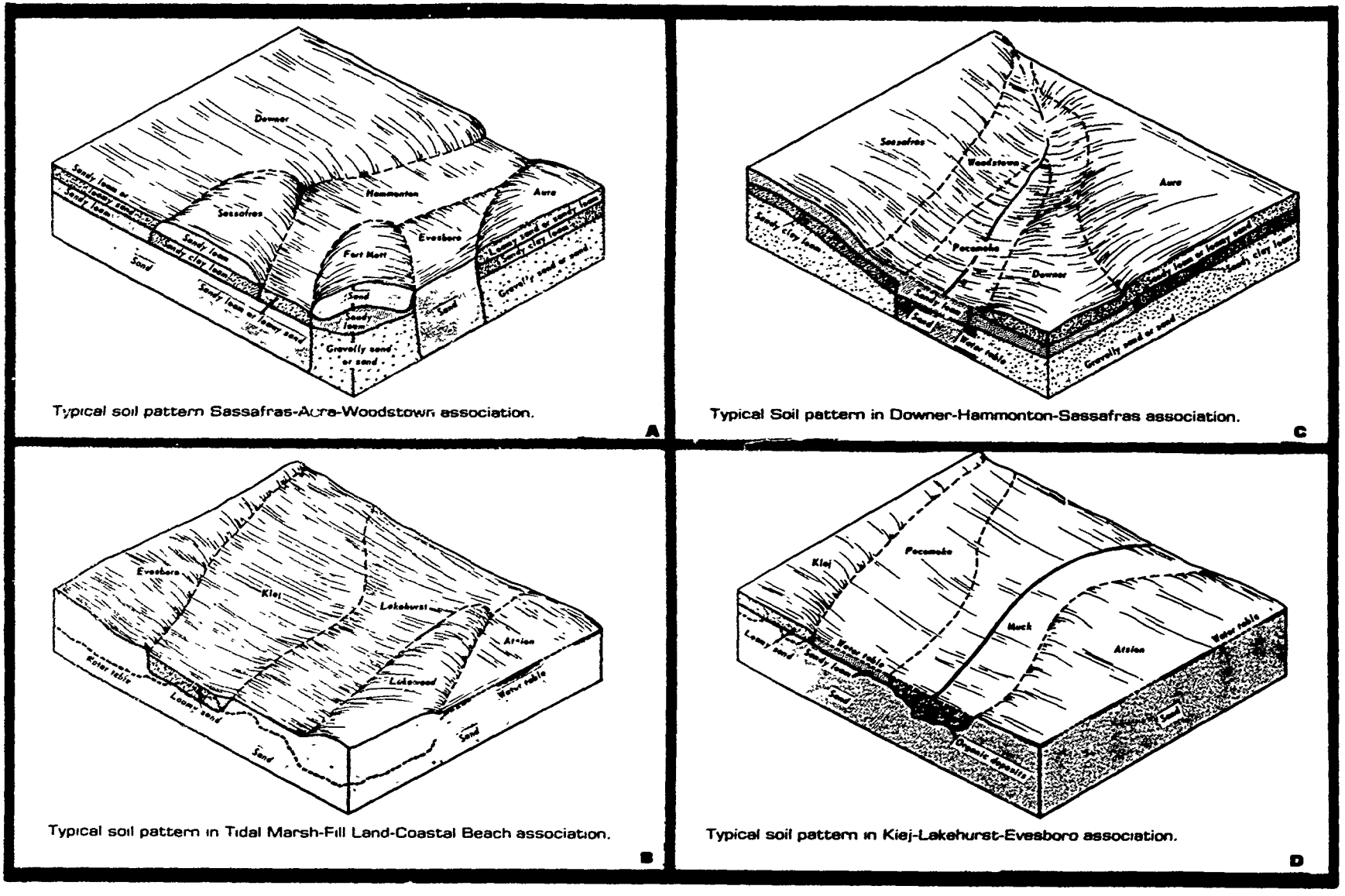
Downer-Hammonton-Sassafras;

Sassafras-Aura-Woodstown;

Klej-Lakehurst-Evesboro; and

Tidal Marsh-Fill Land-Coastal Beach (Figure 1-2).

Figure 1-3 identifies the extent of each of these associations within the sandy area. The Tidal Marsh-Fill Land-Coastal Beach association occupies greater than 80 percent of the project surface area. The remaining associations occur in the inland area between Route 9 and the eastern boundary of the tidal marshes. One small area located south of the Atlantic City Reservoir is underlain by the Atsion-Muck-Pocomoke soil association.



TYPICAL STUDY AREA SOIL PATTERNS

Figure 1-2

1.3 GROUNDWATER RESOURCES

1.3.1 GROUNDWATER GEOLOGY AND HYDROLOGY

Groundwater is found within the unconsolidated sediments underlying the study area. Principal aquifers[1] within the study area are the Kirkwood Formation of middle Miocene age (15 million years before present, [BP]), the Cohansey Sand of early Pliocene-/late Miocene age (5.6 million years BP), and various quaternary age[2] sediments (less than 1.0 million years BP). All of these units dip gently towards the Atlantic Ocean at a rate of 7 to 10 feet per mile. Figure 1-4 presents a summary of the uppermost Coastal Plain sediments which are found beneath the study area. The following sections briefly describe the geology and hydrology of the area's principal aquifers.

1.3.1.1 KIRKWOOD FORMATION

The Kirkwood Formation of middle Miocene age is the oldest Miocene sediment exposed within the State of New Jersey. Surface outcrops of this formation occur along a 5 to 10 mile wide area which extends in a NE-SW direction through Salem, Camden, and Burlington counties.

The depth to the top of the Kirkwood Formation varies from 240 feet below mean sea level (MSL) along the mainland portion of the study area to greater than 290 feet below MSL in the vicinity of Great Egg Harbor Inlet and Absecon Inlet. The greater depth in the inlet area is probably a result of erosion by ancient streams which drained into the Atlantic Ocean. The formation typically contains fine-grained feldspar and thin to thick-bedded quartz sand (Rhodehamel, 1973).

During the period 1963-1965, the average potentiometric surface[3] for the formation was approximately 40 feet below mean sea level in the study area. In this case, the potentiometric surface is a measure of the elevation to which water would rise in a tightly cased well drilled into the Kirkwood Formation. East and west of Absecon Island, the potentiometric surface was measured at approximately 20 feet below MSL. This indicates that well pumpage on Absecon Island had resulted in a lowering of the original potentiometric surface. Most of the water-bearing strata of the Kirkwood Formation are hydraulically interconnected with the overlying Cohansey Sand. In many areas, the distinction between the Kirkwood Formation and the Cohansey Sand is gradual, both geologically and hydraulically.

1.3.1.2 COHANSEY SAND

Cohansey Sand is primarily a quartz sand which contains minor amounts of gravel and pebbly sands, silty sand, and interbedded clay. Like the Kirkwood Formation, the Cohansey Sand beneath the study area is a wedge-like formation, thickening to the east, with an average slope of 10 feet per mile. Contact between the Cohansey and Kirkwood Formations in most investigations is not found to represent a continuous sequence of deposition. According to Rhodenhamel (1973), the Cohansey Sand is the most important freshwater aquifer in the New Jersey Coastal Plain.

Pumping tests in the aquifer near the Mullica River indicate relatively poor hydraulic connections[4] between the aquifer and the river. The hydraulic connection between the aquifer and nearby swamps was found to be better. Overall, however, the marshland which occupies much of the project area is considered to have a low hydraulic conductivity.[5]

---

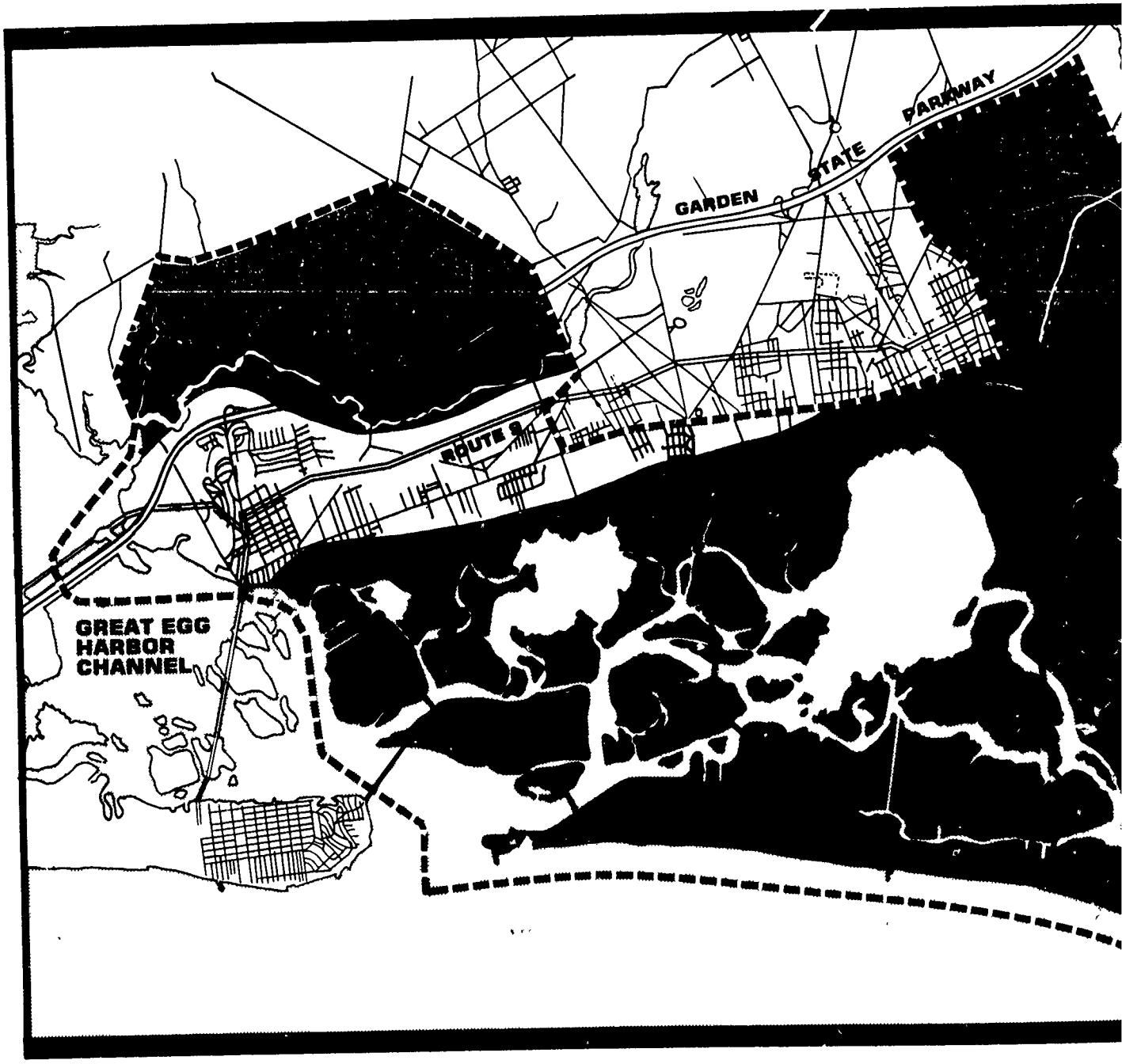
[1]Aquifer — A body of rock that contains sufficient saturated, permeable material to conduct ground water and to yield economically significant quantities of ground water to wells and springs.

[2]Quaternary age — The period of time which covers the last two to three million years.

[3]Potentiometric surface — An imaginary surface representing the static head of groundwater and defined by the level to which water will rise in a well.

[4]Hydraulic connection — Ability of water to move between locations.

[5]Hydraulic conductivity — The rate at which water moves through soil.



Atlantic City Area Wetlands Review

0 1 2MI

0 1 2 3 4KM

Downer-Hammonton-Sassafras

Sassafras-Aura-Woodstown

Klej-La

Atsion-

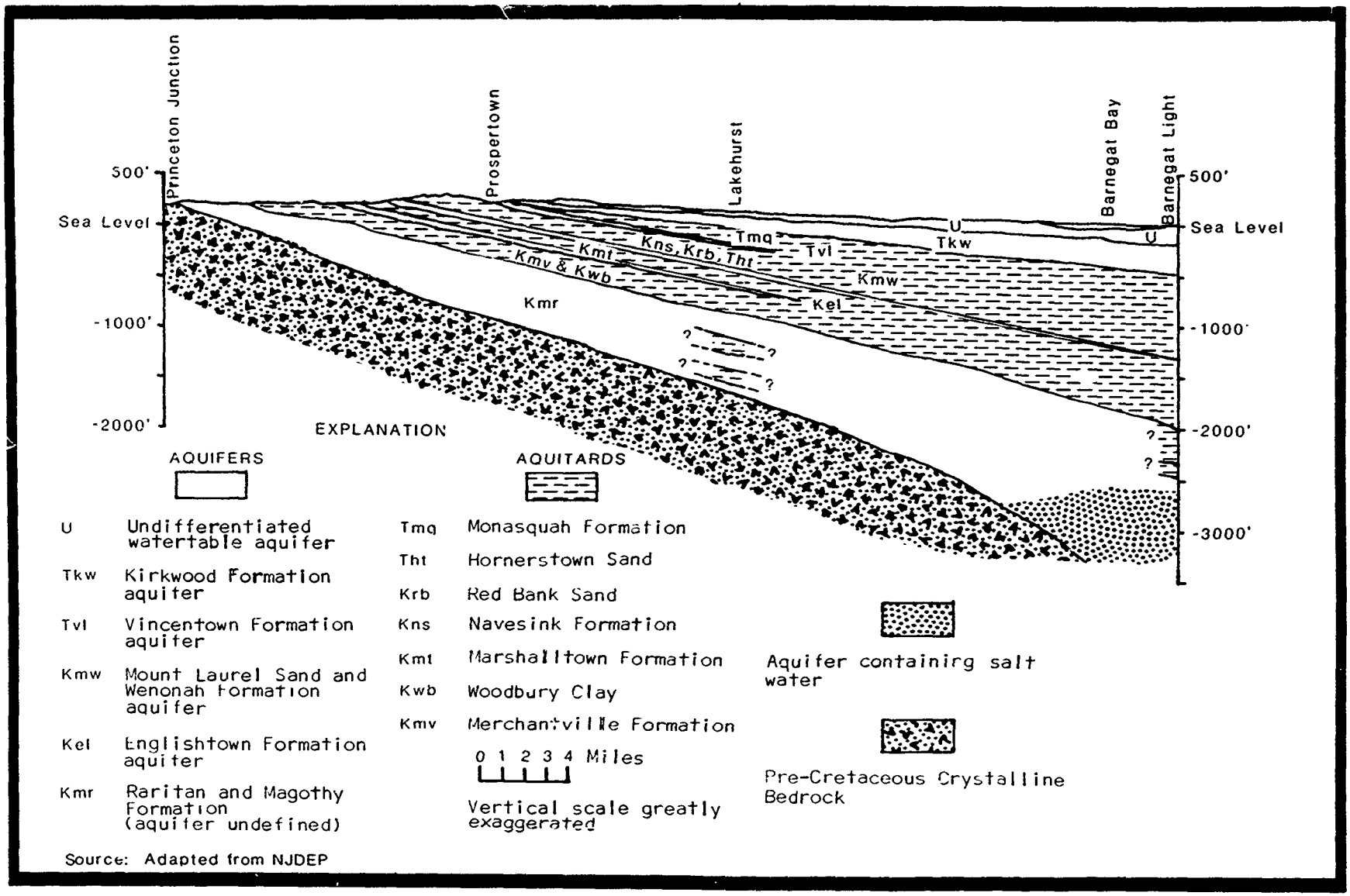
MAJOR SOIL ASSOCIATIONS

Klej-Lakehurst-Evesboro

Atsion-Muck-Pocomoke

Tidal marsh-Fill land-Coastal beach

Figure 1-3



GEOHYDROLOGIC SECTION, COASTAL PLAIN

Figure 1-4

1.3.1.3 QUATERNARY UNITS

Overlying the Kirkwood Formation and the Cohansey Sand are varying thicknesses of younger, quaternary age sediments. These sediments vary from permeable sands and gravel on upland areas to relatively impervious silts and clays characteristic of estuarine areas. The grain size distribution of these units controls their permeability, and hence their effectiveness in recharging underlying aquifers.

Recharge of the two principal aquifers, the Cohansey Sand and the Kirkwood Formation, occurs both through precipitation moving vertically through recent sediments and horizontally from surface outcrops of the formations inland of the project area.

1.3.2 WELL RECORDS AND ANALYSES

Within the study area, groundwater is withdrawn from the Cohansey Sand and the Kirkwood Formation. Figures from 1975-1976 indicate an average groundwater pumpage by the Atlantic City Water Department of 8.5 million gallons per day in the winter and 13.0 million gallons per day during the summer. Well summaries are presented by Clark *et al.* (1968) for Somers Point, Brigantine, Atlantic City, Ventnor, Margate, and Longport. All reported municipal wells, with the exception of those in Somers Point, tap the Kirkwood formation. For the 17 municipal wells analyzed, the mean depth is approximately 760 feet or nearly 450 to 500 feet below the Kirkwood-Cohansey contact. Inland wells in Somers Point tap the Cohansey at depths ranging from 99 to 181 feet. The majority of municipal wells within the study area have been drilled to such depths to avoid saltwater contamination. Data from several Atlantic City wells that are less than 150 feet in depth indicate chloride levels in excess of 13,000 parts per million (ppm), an indication of saltwater intrusion. Many of the municipal wells that tap the Kirkwood formation have projected yields in excess of 700 gallons per minute (gpm) or nearly one million gallons per day.

1.3.3 GROUNDWATER QUALITY

Water from the study area's two principal aquifers has been classified as a sodium bicarbonate-chloride-sulfate type, which with normal treatment, is suitable for drinking and for various industrial uses (Rhodenhamel, 1973).

Table 1-1 presents a summary of water quality based on samples taken from 32 wells in the Atlantic City area.

The majority of the large discharge wells in the study area are of good quality. They are used as sources of potable water and, as such, must be tested regularly by the State of New Jersey. Generally, smaller, shallower wells are of good quality except in two cases:

- Where saltwater zones occur, and
- Where wells are too shallow or are too poorly constructed to avoid contamination by surface runoff.

1.4 SURFACE WATER QUALITY

Atlantic City's regional water resources fall under two State of New Jersey water quality classifications. Waters of the Atlantic Ocean are classified as CW-1 (Coastal Waters - Grade 1), and the estuarine waters behind the barrier beach are classified as TW-1 (Tidal Waters - Grade 1). Both classifications contain the most stringent water quality standards applied to New Jersey tidal waters. CW-1 waters are to be suitable for shellfish harvesting; primary contact recreation (swimming); the maintenance, migration, and propagation of natural and established biota; and other reasonable uses. After appropriate treatment, Class TW-1 waters supply public, industrial, and agricultural water needs. Both classifications have standards for floating, suspended, colloidal, and settleable solids; oil; grease; color; turbidity; and toxic or deleterious substances including mineral acids, caustic alkali, cyanides, heavy metals, carbon dioxide, ammonia or ammonium compounds, chlorine, phenols, and pesticides. Taste and odor-producing substances, pH, dissolved oxygen, temperature, radioactivity, and bacteriological levels also have published standards. TW-1 tidal freshwaters also have standards for total dissolved solids as they relate to waters approved for public consumption.

Table 1-1 SUMMARY OF CHEMICAL QUALITY OF GROUNDWATER ATLANTIC CITY AREA

(Concentration in ppm, except for pH)

Constituent or Property	Kirkwood Formation[1]		Cohansey Sand[2]	
	Range	Median	Range	Median
Iron (Fe)	0.07 - 4.60	0.44	0.02 - 1.60	0.35
Manganese (Mn)	0.00 - 0.26	0.03	0.00 - 0.10	0.00
Calcium (Ca)	2.00 - 13.00	6.80	0.08 - 8.80	1.60
Magnesium (Mg)	0.20 - 2.90	1.70	0.20 - 7.30	1.00
Sodium (Na)	1.50 - 27.00	18.00	0.90 - 11.00	5.40
Potassium (K)	0.70 - 3.60	2.10	0.00 - 1.50	1.00
Bicarbonate (HCO_3)	1.00 - 82.00	65.00	0.00 - 7.00	3.00
Sulfate (SO_4)	6.00 - 14.00	11.00	0.60 - 12.00	4.40
Chloride (C1)	1.90 - 11.00	3.40	2.80 - 34.00	8.20
Nitrate (NO_3)	0.00 - 1.30	0.20	0.00 - 37.00	1.40
Fluoride (F)	0.00 - 0.30	0.20	0.00 - 0.30	0.00
Dissolved Solids	51.00 - 127.00	100.00	16.00 - 135.00	46.00
Total hardness (as $CaCO_3$)	6.00 - 42.00	24.00	3.00 - 22.00	8.00
pH	5.00 - 7.60	7.00	4.50 - 6.00	5.40

[1]Based on samples from 17 wells.

[2]Based on samples from 15 wells. Analyses from the following three wells tapping the Cohansey Sand were not used in this summary because of their vastly different chemical quality: Somers Point 4, Atlantic City 3 and 4.

Water quality observations by the New Jersey Division of Water Resources were made in Lakes and Scull Bays. The fecal coliform standard for TW-1 waters is a mean of 200/100 ml. Of 43 stations sampled within the area, 27 had fecal coliform[1] levels over 700/100 ml. During the summer of 1978, the bacterial coliform levels were in excess of the limit for TW-1 areas. Since these data were collected, however, the new regional sewage treatment plant has commenced operation and has alleviated much of this problem.

Distinctions regarding temperature and dissolved oxygen standards are made between waters classified as trout maintenance or nontrout maintenance waters. All waters in the Atlantic City region are classified as nontrout maintenance waters by NJDEP. Only those temperature standards which relate to the limits of heat dissipation apply to the study area. Data supplied by Mr. John McLain of the NJDEP, Division of Fish, Game, and Wildlife, indicate that TW-1 standards for dissolved oxygen are generally being met. There were five locations where concentrations were found to be less than 5.0 milligrams per liter (mg/l), however. All instances of low dissolved oxygen concentration occurred in late June or July. Summer water temperatures were quite warm with recordings higher than 28°C. Since there are no thermal discharges in the study area, the high temperatures are considered to be a result of the back bays' shallow depth and limited exchange of tidal waters.

Water clarity, as measured with a Secchi disc, varied from less than 0.5 meter to over 2 meters. According to Durand (1978), light penetration in the shallow water bays is often less than 0.5 meters due to wind suspension of bottom sediments.

Little or no data exists for solids, toxic or deleterious substances, water chemistry, or the area's hydrographic patterns.

1.5 COASTAL PROCESSES

The morphology of the back bays reflects a number of sediment sources as well as the influence of man. As the last glacier melted and the sea level began to rise, a number of nearshore bars developed parallel to the shoreline. In time, the bars moved landward to their present positions and developed into barrier islands. Between the barrier islands and the mainland, the quieter waters of the bays filled with sediments derived from the mainland and from sediments brought into the bays by the tides and by storm overwash. In time, the bay areas filled with sediment and were colonized by marsh vegetation.

Within the study area, the estuarine system's ebb tidal deltas[2] are some of the most active areas in regard to accumulation of sediment. Flood tidal deltas are also present landward of the three study area inlets, but they are essentially inactive. The period during which the flood-tidal deltas were active is unknown, but it is likely to have occurred when the inlet openings were larger and there was freer passage of water between the ocean and bays. Works of man, filling, dredging, and the construction of numerous roadway embankments, have significantly altered patterns of water circulation among the study areas four embayments[3] and between the embayments and the open ocean.

Within the study area, coastal processes may be subdivided into estuarine, beach, and nearshore processes. Of these, estuarine[4] areas occupy the greatest portion of the study area. In terms of data availability for the study area, however, their ranking is reversed. This is due in part to the economic value of beach areas to the tourist industry of Atlantic City and to studies associated with the once proposed offshore nuclear power plant. At Brigantine Inlet, a significant amount of data on beach processes has been collected. Data for the estuarine and nearshore areas are generally lacking, especially with respect to bottom sediment characteristics and current regimes. As a result, discussion of these areas relies principally on aerial photographs and map interpretation and on studies of nearby coastal areas.

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[1]Fecal coliform level is a bacterial indicator of water quality.

[2]Ebb tidal deltas — Sediment accumulation formed seaward of an inlet by ebb tidal currents.

[3]Embayment — A shallow water area located between upland and ocean.

[4]Estuarine — Pertaining to an estuary; a semi-enclosed, coastal water body with an open connection to the sea within which sea water is diluted with fresh water derived from an upland source.

1.5.1 GENERAL PHYSICAL PROCESSES

At Atlantic City, the tides are semi-diurnal[1] with an average variation of 3.9 feet and a spring tidal[2] range of 4.9 feet. Work by Davies (1964), Hayes (1975), and Nummedal *et al.* (1977) have demonstrated that the morphological characteristics of tidal inlet - back bay systems are significantly affected by the tidal range. According to Davies' classification, the project area is microtidal. This means that it has a tidal range averaging less than 6 feet. Coasts of this sort typically have long, narrow barrier islands seaward of shallow lagoons.[3]

As depicted in Figure 1-5, the bulk of the tidal inlet shoals are located on the lagoon side of the inlet throats.

1.5.2 WAVE AND CURRENT CHARACTERISTICS

Wave data for Atlantic City were collected at the Steel Pier between 1957 and 1967 by the Corp's Coastal Engineering Research Center. Thompson and Harris (1972) indicated that the mean wave height for this period was approximately 3 feet and that less than 1 percent of the waves exceeded 10.1 feet. Over 800 visual observations of wave approach at the outer breaker zone[4] were made between 1968 and 1978 (Everts *et al.*, 1973).

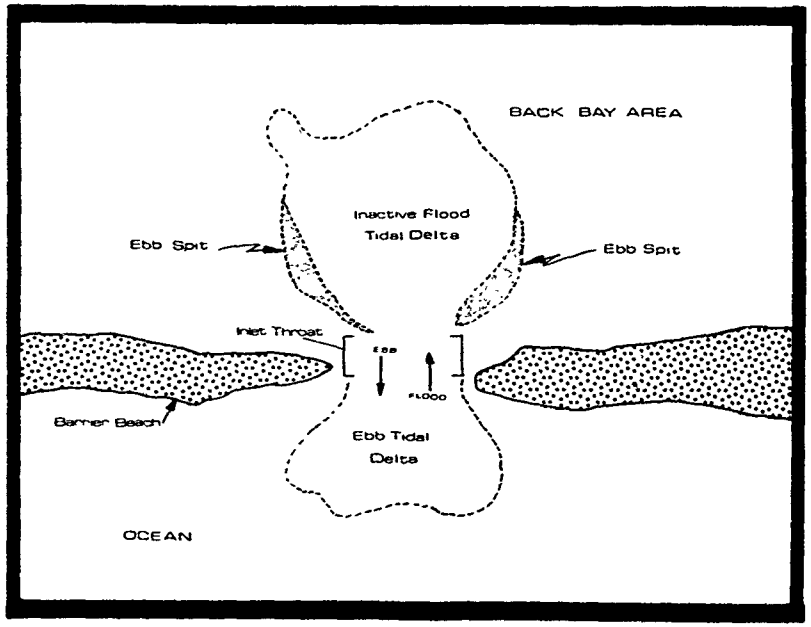
Waves generally approach the shore from the north at a slight angle. Only during February, March, and April did a noticeable percentage of the waves approach from the south. Their relatively slight angle of approach indicates that the wave generated

[1]Semi-diurnal — A tide with two high and two low waters in a tidal day.

[2]Spring tide - A tide that occurs at or near the time of new or full moon and which deviates the most from mean sea level.

[3]The lagoons of the study area are collectively known as the back bays.

[4]Breaker Zone — The point at which waves break.



IDEALIZED COASTAL GEOMORPHOLOGY **Figure 1-5**

longshore currents are of lesser velocity than they are in areas with waves having a greater angle of approach. For most of the year, wave generated currents move along the study area in a southerly direction. Darling (1968) reports that over seventy percent of the waves measured between 1955 and 1964 had periods[5] of five to six seconds.

With the exception of Absecon Inlet, current data are generally lacking for the study area. Maximum observed ebb and flood velocities of 3.4 knots and 3.7 knots respectively are reported for Absecon Inlet by the Corps (1975).

[5]Period — The time for two successive wave crests to pass a fixed point.

1.6 ESTUARINE PROCESSES

1.6.1 INTRODUCTION

Landward of Absecon and Brigantine Islands are extensive estuarine areas. These areas are composed of a number of subtidal[1] and supratidal[2] features including tidal water channels, islands, and several large expanses of open water. Within these areas, water depths are relatively shallow, ranging from 0.5 feet to 6.0 feet at mean low water. The islands of the bays are typically dominated by saltmarsh vegetation.

A time-velocity asymmetry[3] exists in the study area systems with respect to currents. The strongest currents occur just before high tide when the tidal channels have filled and the marsh surface is beginning to flood. Flows near low tide are generally weaker and are associated with the much slower discharge and recharge of the tidal creek system (Swift, 1976). The duration of the flood and ebb cycles are often dissimilar; the latter usually exceeding the former.

1.6.2 INLETS

The ocean is connected to the estuarine areas by three inlets: Brigantine, Absecon, and Great Egg Harbor. All of these inlets are ebb-dominated and have ebb tidal deltas[4] of varying size. However, inlet dredging projects have altered the natural shapes and sizes of these deltas.

In the lagoon[5]-inlet system, the inlets play an important role in water movement and sediment transport between lagoonal areas and the ocean. For this and other reasons, the inlets have received considerably more attention than the lagoonal areas. A discussion of each inlet follows.

1.6.2.1 BRIGANTINE INLET

Brigantine Inlet, nearly 1,000 feet wide, is an offset inlet[6] with the downdrift side protruding furthest into the sea. The inlet area includes flood and ebb channels, an ebb tidal delta, swash bars,[7] and ebb splits.[8] According to Krauser and Coch (1978), "Brigantine Inlet is sediment starved as it receives only a small amount of relatively fine sediment, mostly from southwesterly longshore drift." This sediment is reworked in the inlet area by tidal currents. Much of it is transported out of the inlet and deposited on the ebb tidal delta.

The ebb current within Brigantine Inlet is diverted to the south which results in an asymmetrical tidal delta. Examination of inlet aerial photographs from 1949, 1964, and 1971 indicates that asymmetry was less in 1949 than in more recent years. In the 1949 photograph Little Mud Thorofare discharged into the ocean northeast of Brigantine Channel. During the 1962 storm, the sand bar which separated the two channels was breached. This caused Little Mud Thorofare to discharge into Brigantine Channel before discharging into the ocean. As a result, the ebb tidal delta now receives proportionally more sediment along its southern edge. The southerly growth of Little Beach Island to the north and the northerly growth of Brigantine Island to the south have greatly narrowed Brigantine Inlet during the past 30 years (Coastal Dynamics, Inc., 1974).

The dominant longshore sand transport direction is southwesterly. Wave refraction[9] around the ebb tidal delta, however, has

[1]Subtidal — The area below mean low tide.

[2]Supratidal — The shore area just above mean high tide.

[3]Time velocity asymmetry — The relationship between tidal stage and current velocity is such that the maximum flood velocities are generally between mid and high tide while maximum ebb currents occur at low water.

[4]Ebb tidal deltas — The sediment accumulation formed seaward of an inlet by ebb tidal currents.

[5]Lagoon — A shallow body of water usually connected to the sea.

[6] Offset inlet — An inlet in which one of the sides of the inlet protrudes further seaward than does the other side.

[7]Swash bars — Sand bars formed by wave action, often along ebb tidal deltas.

[8]Ebb spits — Spits formed in an estuary as a result of ebb currents.

[9]Wave refraction — The process by which the direction of a wave moving in shallow water is changed. The part of the wave advancing in shallow water moves more slowly than that part advancing in deeper water causing the wave crest to bend toward alignment with the bottom contours (U.S. Army CERC, 1972).

resulted in a localized reversal in drift direction which results in the northeastward growth of Brigantine Island.

1.6.2.2 ABSECON INLET

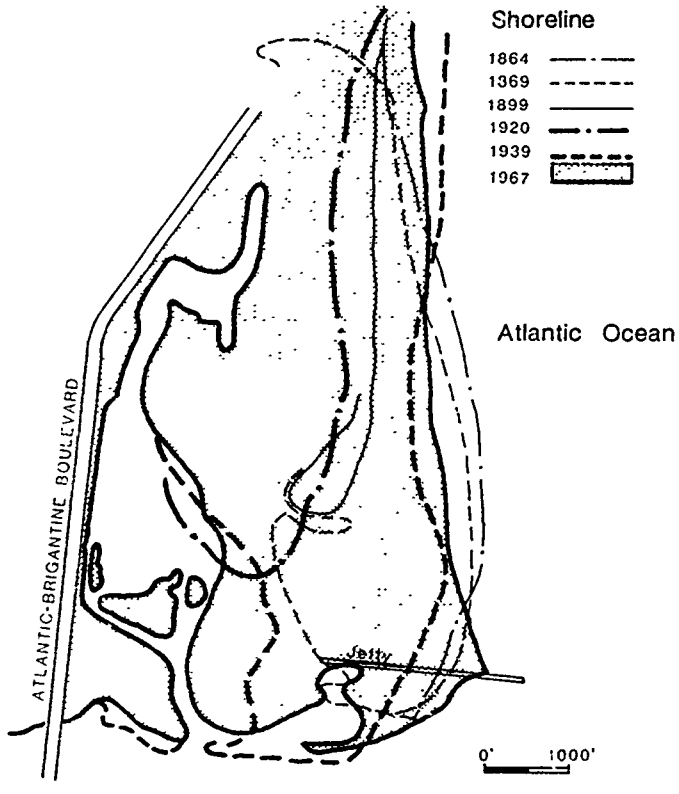
Absecon Inlet has been intensively modified by man over the last one hundred years. Jack McCormick and Associates (1975) documented the history of the inlet from 1841 until 1975 as part of a Draft Environmental Impact Statement prepared for the Ocean Harbor Development, Brigantine, New Jersey. Figure 1-6, taken from that document, indicates the location of selected shoreline boundaries since 1864.

The frequency and strength of particular storm events played major roles in historical shoreline alteration. In 1922, the old main channel was diverted to the south by the construction of the Atlantic Brigantine Boulevard. Leading to accelerated accretion[1] at the southern end of Brigantine Island. The completion in 1961 of a 3,200 foot jetty on the north side of the inlet marked the beginning of a period of less dramatic change. Examination of inlet photographs taken in 1964 and 1971 indicates the jetty trapped considerable amounts of sediment on the Brigantine Island side of the inlet. The 1964 photograph, taken when the jetty was approximately one half its present length, shows that some sand was bypassing the jetty and being deposited in a small recurved spit within the inlet. Subsequent lengthening of the jetty and dredging within the inlet have reduced the volume of sediment in the inlet. Shoaling is still a problem, however, and periodic maintenance dredging is necessary.

1.6.2.3 GREAT EGG HARBOR INLET

Great Egg Harbor Inlet is the southernmost inlet in the study area. It is also the widest of the three inlets and has perhaps the best developed ebb tidal delta. Presently it is not stabilized by a jetty although development extends close to the water's edge on its northern and southern sides.

[1]Accretion — A buildup of sediment over a given area either by natural or artificial means.



Shorelines of the southern section of Brigantine Island, Atlantic County, New Jersey, 1841-1967. Information for 1841 to 1920 from New Jersey Board of Commerce and Navigation (1923); 1939 and 1967 shorelines from U.S. Coast and Geodetic Survey (1939, 1967).

Source: J McCormick Assoc

SHORELINES **Figure 1-6**

As with the previously discussed inlets, major changes have occurred in its configuration. At various times in the past, two channels have existed in the inlet, although at present there is only one. A survey in 1975 indicates that the inlet throat decreased from 1,100 feet in 1964 to approximately 600 feet in 1975. This led to creation of a relatively steep-sided inlet channel which can be observed at the present time (Corps, 1976). Drifter measurements[1] (Corps, 1949) indicated mid-channel ebb currents moving at approximately 4 feet per second. Closer to the edge of the channel, currents of 2 - 2.5 feet per second were recorded. Flood currents velocities reached 3 feet per second. These current speeds are thought to be representative of present conditions, although subsequent narrowing of the inlet would result in higher, swifter current speeds. Hydrographic surveys over the last 20 years indicate a significant increase in the size of the ebb tidal delta. The losses of beach sand from northern Peck Beach and southern Absecon Island have contributed to accretion of the delta.

1.7 BEACH AND NEARSHORE PROCESSES

Beaches are subject to four major forces:

- tidal currents,
- wave-induced forces,
- sea level rise, and
- effects of man.

Singularly, or in combination, these processes are the principal determinants of the size and shape of the study area's beaches.

One of the most significant factors responsible for the erosional characteristic of the study area's beaches is the rise in sea level which has occurred within the past several thousand years. Data on sea level rise compiled by Marmer (1952), Hicks (1973), and Hicks and Crosby (1974) correlate with rates of shoreline recession within the study area. A study by Dames and Moore (1974) and Marmer (1952) indicate a rise in sea level at Atlantic City of approximately 15 centimeters between 1911 and 1950. Averaged over a century this represents an overall sea level rise of about 38 centimeters (15 inches).

Coastal Dynamics Inc. (1974) proposed a general classification of beach profiles for Brigantine Island which is also applicable to Absecon Island. These profile types include:

- tide dominant,
- wave dominant accretional,
- wave dominant non-accretional, and
- mixed (tidal and wave influence).

The four major types of beach profiles are indicated in Figure 1-7 and are discussed below.

Tide dominant beach profiles typically have steep narrow beach faces and long, low-gradient backshore areas which are subject to aeolian[1] disposition. Within the project boundaries, all tide dominant locations are located in close proximity to active tidal channels and inlets. Severe beach erosion can occur in these areas at any time. Significant beach erosion results when active offshore tidal channels move closer to the foreshore[2] (Coastal Dynamics, Inc., 1974).

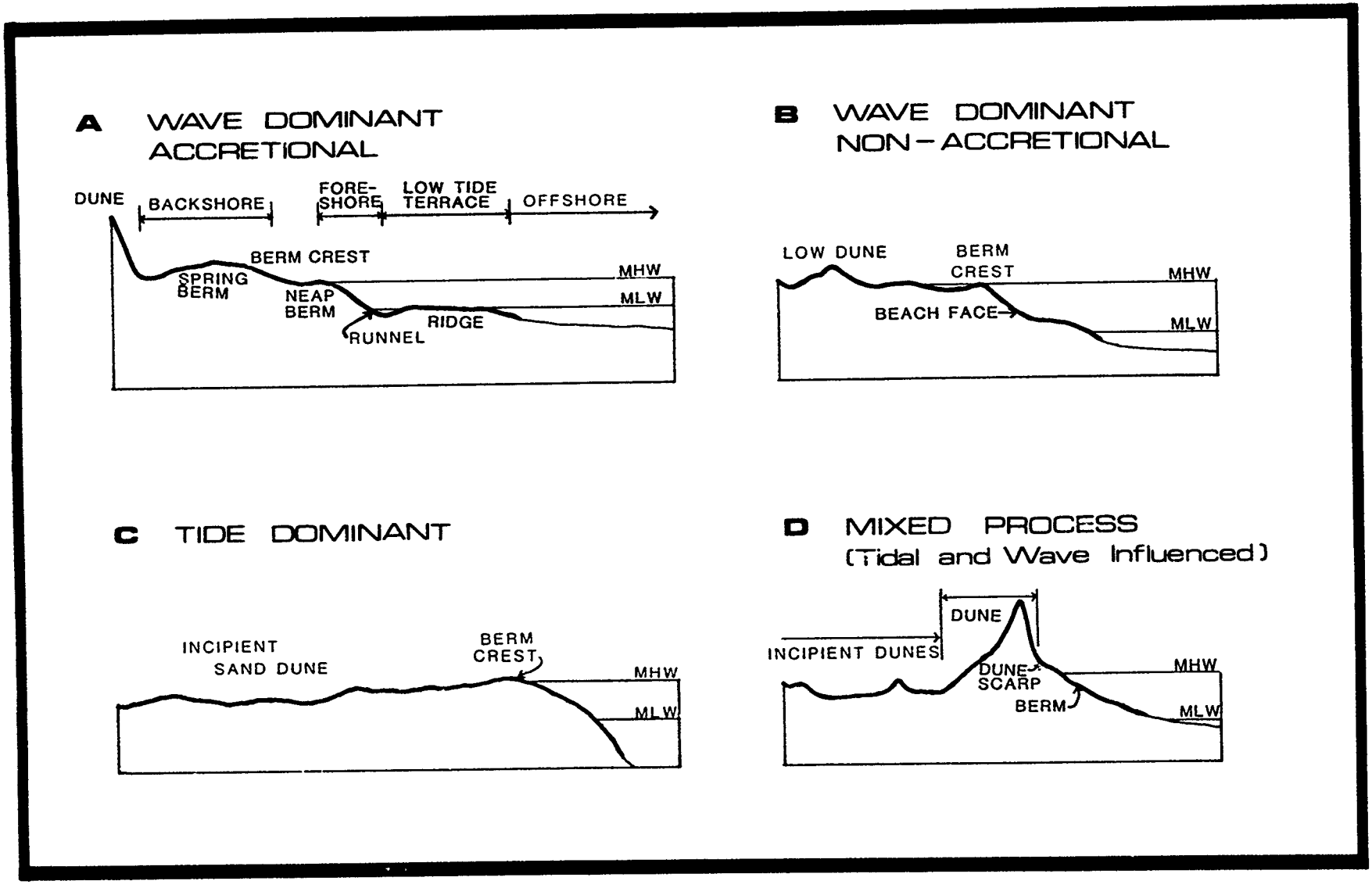
Wave dominant sites are subdivided into accretional and non-accretional. These areas are distant from major tidal channel influence. Wave dominant accretional beaches typically have wide, gently sloping intertidal zones on which active ridge and runnel systems[3] are formed. In general, these are areas of relatively low wave energy. Non-accretional wave dominant beaches character-

[1]Drifter measurements — Current measurements made by timing the movement or drift of objects floating on water.

[1]Aeolian — Materials transported and laid down by wind.

[2]Foreshore — The part of the shore lying between the upper limit of wave wash at high tide and the ordinary low water mark.

[3]Ridge and runnel system — A combination of a ridge (tabular sand body) and a trough that develops on the low tide beach and generally migrates landward.



MAJOR BEACH PROFILES OF THE STUDY AREA CLASSIFIED BY DOMINANT PROCESS

Figure 1-7

ize areas of somewhat higher wave energy. As a result of higher wave energy, more narrow and steep intertidal zones are created. Variations in wave energy within wave dominated areas of the beach may be a result of wave refraction over nearshore features or of actual differences in incoming wave heights. This is especially true for Brigantine Island where nearshore topography consists of linear shoals oriented in an east-west direction. Unlike Brigantine Island, the nearshore topography off Absecon Island slopes gently seaward (Coastal Dynamics, Inc., 1974).

Figure 1-8 applies this classification scheme to the beaches of Brigantine and Absecon Islands. Location of beach profile types for Brigantine Island was based on the results of beach profile monitoring and of aerial photograph interpretation. Location of beach profile types for Absecon Island were based primarily on an analysis of aerial photographs.

1.7.1 BRIGANTINE ISLAND

Coastal Dynamics, Inc. (1974) monitored six beach profile locations along Brigantine Island between 1973 and 1974 (Figure 1-8). Of these profiles, No. 4 is wave dominant accretional. Nos. 5 and 6 are wave dominant non-accretional. No. 1 is tide dominant. Profiles Nos. 2 and 3 are mixed tide dominant and wave dominant accretional. These different classifications reflect their location with respect to tidal inlets and nearshore topography.

The most northern of the beach profiles is influenced by the currents of the tidal channel on the sourthern side of Brigantine Inlet. The "mixed" beach profiles to the south (Nos. 2 and 3) exhibit both wave and tidal influences. Profiles classified as wave dominant accretional occur farther to the south, away from the inlet. The southernmost profiles of the study area (Nos. 4, 5, and 6) have wooden bulkheads and paved roadways on their landward ends. These profiles are generally flat in the low tide terraces[1] on which ridge and runnel systems commonly occur. Old timber seawalls (see profiles Nos. 4 and 5) located several hundred feet seaward of the existing bulkheads offer dramatic evidence of the recent erosional history of Brigantine Island. On profile No. 6, which is located at the Brigantine Motor Hotel, the high tide line has advanced landward nearly 600 feet in the last 50 years.

Storm overwash areas are located along much of the unpopulated northern end of Brigantine Island. Although the same processes occur along the southern portions of the island, bulkheads, seawalls, and buildings interfere with natural overwash processes. The results of this interference, particularly during storms, includes the destruction of existing structures as well as increased beach erosion. The latter is due to the concentration of wave energy in the beach zone rather than across the island. Figure 1-8 indicates a number of visible overwash locations, many of which were active during the March, 1962 storm. In some cases, revegetation has occurred, but these areas remain prime locations for future storm overwash events.

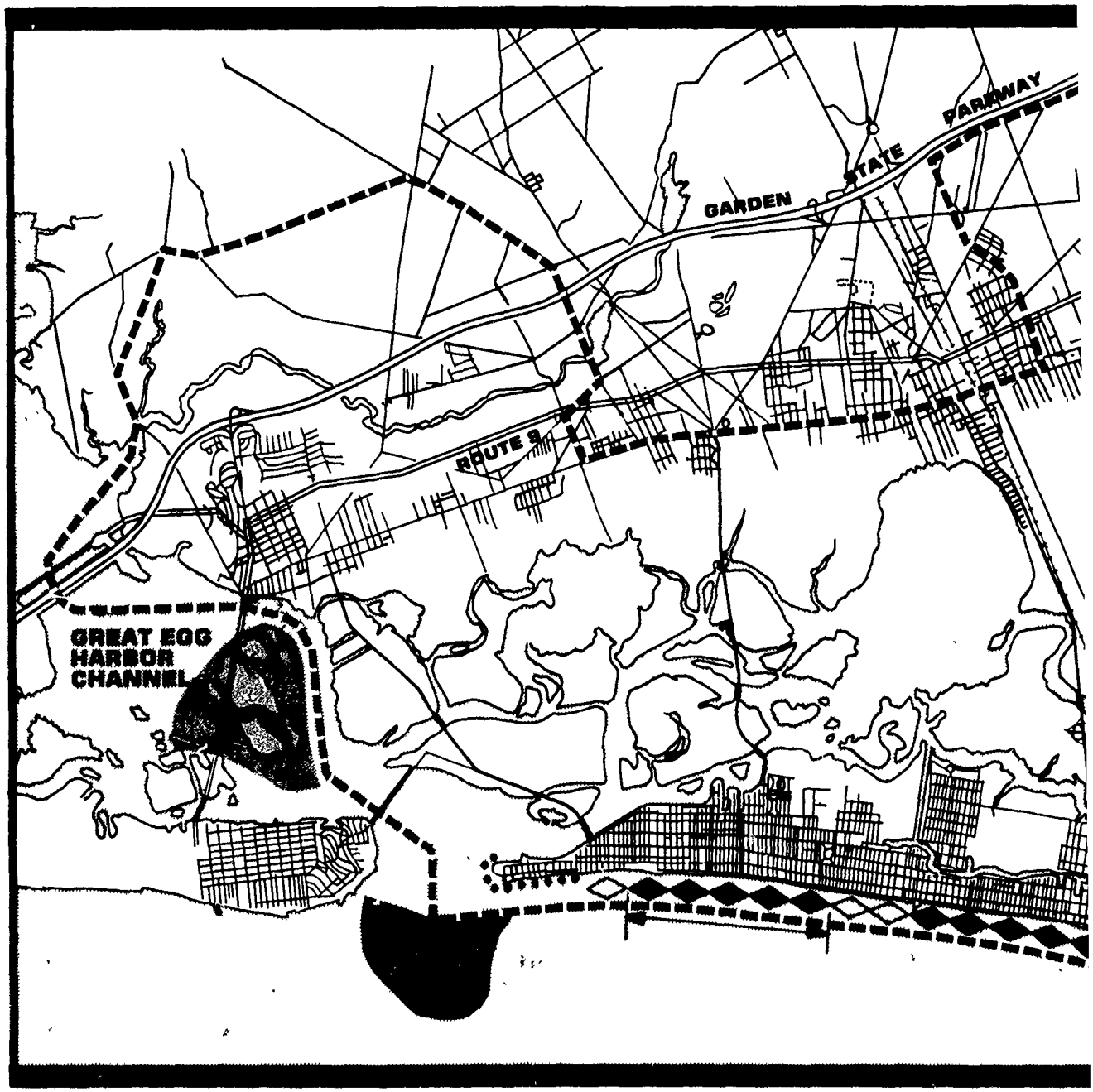
Coastal Dynamics, Inc. (1974) computed the annual erosion/accretion rate for 1973-1974 at each of the Brigantine Island study locations. The total net annual volume change for each location is presented in Table 1-2.

Table 1-2 PROFILE CHANGES — BRIGANTINE ISLAND 1973 - 1974

Location	Net Annual Change*
1	-265.7
2	+796.9
3	+1147.1
4	+391.7
5	-141.4
6	+215.2

*Cubic feet of sand per linear foot of beach

[1]Low tide terrace - Flat portion of beach which is exposed only at low tide.



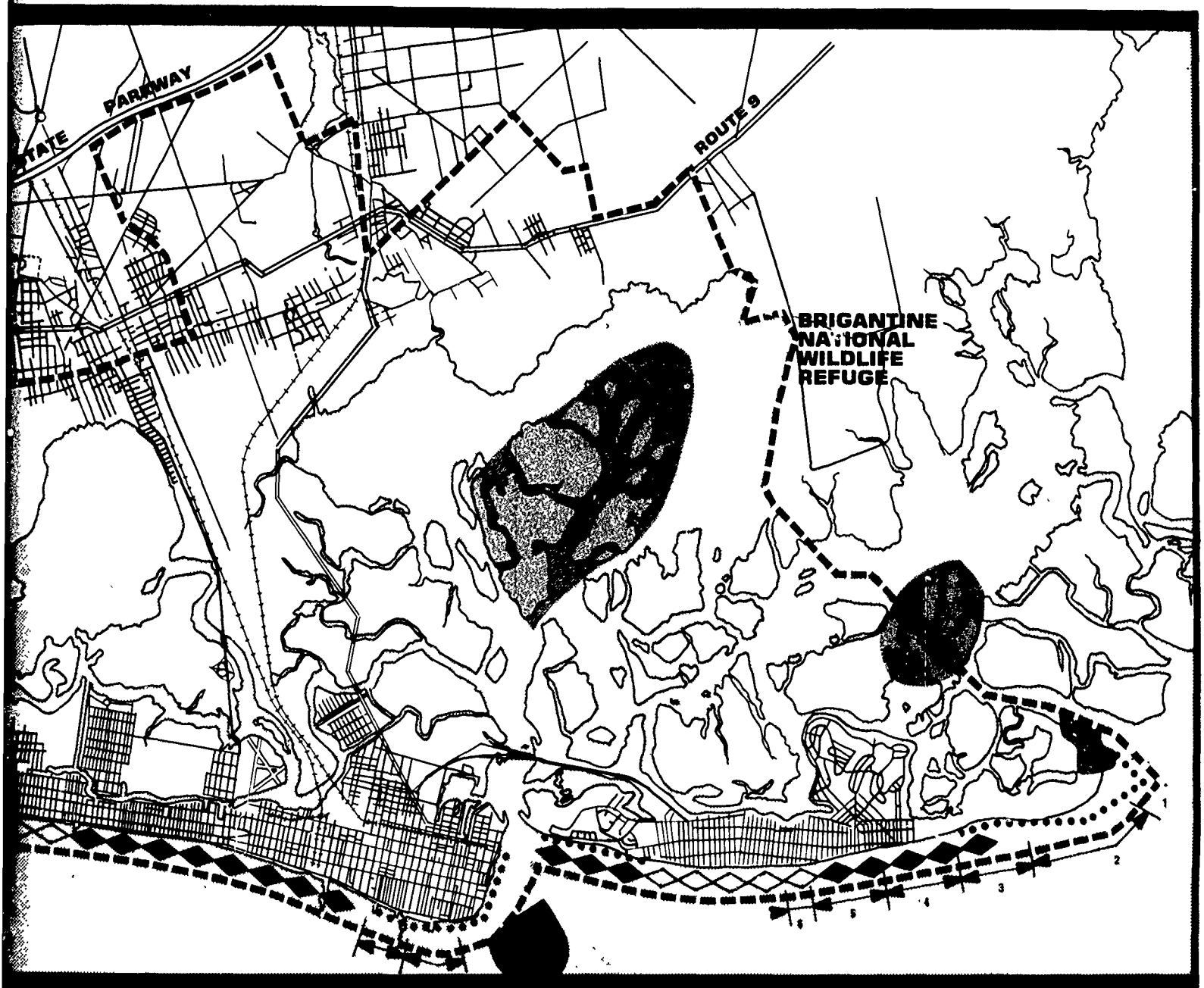
Atlantic City Area Wetlands Review

0 1 2MI

0 1 2 3 4KM

Beach Profile Location

Tide Dominant



Inactive Flood Tidal Delta

Ebb Tidal Delta

Storm Overwash

Wave Dominant Accretional

Wave Dominant Erosional

COASTAL MORPHOLOGY AND BEACH CLASSIFICATION

Figure 1-8

It should be noted that these figures are for only one year and could change in response to different patterns of storm activity. At locations 4, 5, and 6, bulkheads or roads are found at the landward ends of the profiles. During storm conditions, these structures could increase local wave scour which could result in a reversal of present accretional trends.

1.7.2 ABSECON ISLAND

Erosion rates for northern Absecon Island have been computed by the Corps (Everts and Czerinak, 1977). Table 1-3 summarizes the ranges of beach volume changes at Atlantic City over several time periods:

Table 1-3 BEACH VOLUME CHANGES, ATLANTIC CITY

Interval	Change (Cubic feet of sand/linear foot)
Storm[1]	216
Month to month[2]	
gain	113
loss	225
Seasonal range[3]	405
Year to year[4]	
gain	180
loss	144
Maximum 10 year[5]	234
Net 7 year[6]	0

[1]Difference between pre- and post-storm surveys.
[2]Maximum change between consecutive months.
[3]Average monthly maximum minus average monthly minimum.
[4]Maximum change between consecutive years.
[5]Maximum for any year minus minimum for any year.
[6]Least squares fit to 1963-1969 yearly average data.

The net 7 year figure represents essentially natural conditions during which no beach filling occurred. Over a longer period of time it is likely that without beach nourishment programs net erosion of the beaches would occur due to the rise in sea level. Measurements taken over shorter time periods may, however, indicate accretion at various locations due to the impacts of groins, other man-made sediment traps, or from the migration of sand humps along the shoreline.

1.8 CLIMATE

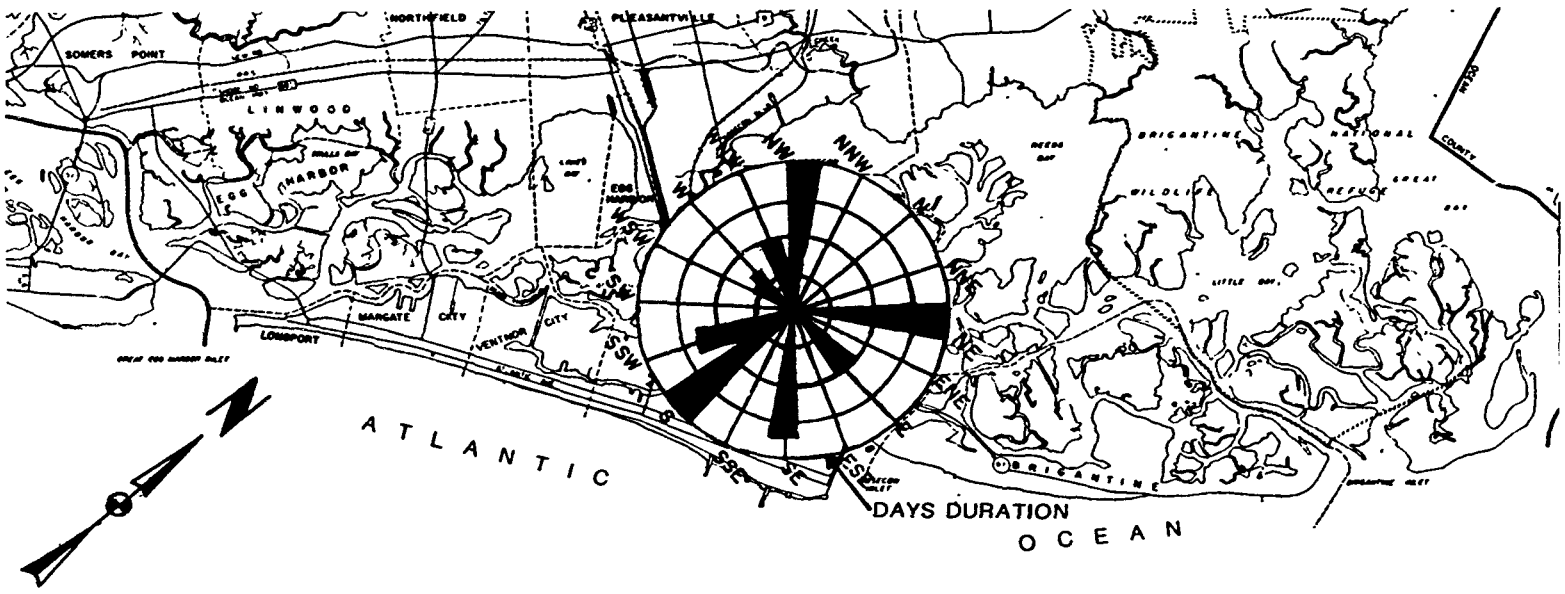
The climate of the Atlantic City region is similar to that of other portions of the New Jersey coast. The average annual temperature is approximately 54°F. The low monthly averages occur during January and February at about 35°F. The high monthly averages occur during July and August at between 74 and 75°F.

Precipitation is evenly distributed throughout the year. The monthly means range from approximately 3 to 5 inches with a total annual precipitation of approximately 42 inches. The maximum annual 24 hour storm brings approximately 6 inches of precipitation. Prevailing winds in the area are from the south from April through August and from the west and west-northwest during the balance of the year (Figure 1.9). Maximum wind speeds may be in excess of 50 miles per hour. Northeast storm winds with accompanying high water levels cause the study area's most severe erosion of beaches, dredge material disposal sites, and bayside banks.

During the winter, navigation along the Intracoastal Waterway is sometimes blocked by ice. During extremely cold winters, ice completely closes the back bays to navigation. The inlets are rarely closed but passage is sometimes difficult because of running ice.

1.8.1 HISTORIC STORM DATA

Storms have played a major role in shaping the land forms of the study area. Wave energy associated with storms has the ability to quickly reverse or alter sediment accumulation patterns which have resulted from long periods of relative quiescence. Major storms which have affected the project area are of two basic types, hurricanes and northeasters. The relative impact of these storms is



NOTE:

A wind rose is a graphic representation of the percentage of the time that the wind blows from various directions. In this instance, it shows a prevalence of winds from three directions during the period of measurement; the northwest, the northeast, and the south.

April - September 1971
Source: Ichthyological Associates

COMPOSITE WIND ROSE

Figure 1-9

the result of a number of factors including duration, frequency, fetch[1], wind speed, dominant wind direction, and tidal range during the storm. In terms of property loss, hurricanes have had the greatest impact on the study area. The March, 1962 storm, however, caused the greatest tidal flooding of record in the area. The following list of major storms over the last 50 years has been compiled by the Corps, Philadelphia District (1975):

[1]Fetch - The horizontal distance over which wind generates waves

Hurricane of August 1933. The center of the hurricane of August, 1933, crossed inland over the middle Atlantic Coast and passed close to Norfolk, Virginia. The storm passed about 125 miles west of Atlantic City subjecting the study area to onshore winds generated by the northern portion of the storm. The comparatively unusual path of this hurricane increased the fetch and duration of onshore winds. Atlantic City reported a wind of one minute duration of 76 miles per hour from the east and a maximum tide elevation of 5.0 feet above mean

sea level. Atlantic City suffered $47,000 in damages exclusive of losses in beach materials.

Hurricane of September 1944. This storm paralleled the coastline from Cape Hatteras to eastern Long Island. At Atlantic City, the maximum wind velocity of five minute duration was 82 miles per hour from the north quadrant. The storm passed the New Jersey coast near the predicted time of high tide. Gusts of 92 miles per hour and a high tide of 10 feet above mean low water were reported at the Naval Air Station, Cape May, New Jersey.

Storm of November 1950. The extratropical storm of November 24-27, 1950, approached the project area from the south. Extremely strong onshore winds prevailed along the northern half of the Atlantic Coast. Gusts of up to 70 miles per hour were recorded both in Delaware and New York. Tides reached a height of 7.0 feet above mean sea level at Atlantic City. Piers, boardwalks, bulkheads, private homes, and commercial buildings along the entire length of the New Jersey Coast were extensively damaged.

Hurricane of September, 1960. Hurricane Donna passed northeast of New Jersey on the 12th of September. The observed greatest one minute velocity was 60 miles per hour from the northwest. The peak gust at Atlantic City was 83 miles per hour from the west-northwest. The maximum tide reached 6.1 feet above mean sea level. Wave action along the coast was severe.

Hurricane Carol, August, 1961. Hurricane Carol passed offshore of Atlantic City late on August 30, 1961, before making landfall in eastern Long Island on August 31. The maximum observed storm surge[2] was 2.5 feet (Harris, 1963).

Storm of March, 1962. The storm of March 6-8, 1962 resulted from the combination of two storms, one moving northerly along the coast and the other moving easterly from the Mississippi Valley. U.S. Weather Bureau data show that the maximum wind velocity of one minute duration attained at Atlantic City was 44 miles per hour. Gusts of up to 58 miles per hour were recorded. The storm occurred during the period of spring tides which contributed to the tide reaching a height of 7.2 feet above mean sea level. Five successive periods of extreme high water flooding were recorded by a gauge on the Steel Pier at Atlantic City on March 6, 7, and 8.

The storm of March, 1962 caused the greatest tidal flooding on record in the study area.

Tables 1-4 and 1-5 detail the extent of the March, 1962 storm-related casualties and property damage within Atlantic County (Corps, 1963). Though the figures are for Atlantic County, most of the county's coastline is within the study area.

[1]Extratropical — A cyclonic disturbance occurring north or south of the Tropic of Cancer or Capricorn respectively.

[2]Storm surge — A rise above normal water level due to the action of wind on the water. Storm surge resulting from a hurricane also includes that rise in water level due to atmospheric pressure reduction.

Table 1-4 FAMILIES AND STRUCTURES AFFECTED IN ATLANTIC COUNTY, NEW JERSEY

Item	Number
Killed	4
Minor Injuries	237
Major Injuries	85
Hospitalized	9
Dwellings destroyed	24
Dwellings - major damage	243
Dwellings - minor damage	13,453
Other bldgs. destroyed	0
Other bldgs. major damage	0
Other bldgs. minor damage	854

Source: Report on "Operation Five-High," March, 1962 Storm, Corps, 1963.

Table 1-5 **SUMMARY OF STORM DAMAGES IN ATLANTIC COUNTY, NEW JERSEY**

Item	Damage (Dollars)
Residences and contents (private)	$14,241,000
Commercial buildings and contents (private)	7,613,000
Public property (Federal, State or local installations)	552,000
Roads, bridges, railroads	614,000
Boats	87,000
Utilities losses	358,000
Protective shorefront bulkheads seawalls, groins, jetties	566,000
Boardwalks	979,000
Beaches and dunes	2,100,000
Other losses	1,121,000
TOTAL	$28,231,000

Source: Report on "Operation Five-High," March, 1962 Storm, Corps, 1963.

1.8.2 EFFECTS OF THE MARCH, 1962 STORM

Tidal flooding from inland waters reached a depth of about 4 feet in many portions of Brigantine Island. Beach and dune damages were extensive. Approximately 355 feet of timber bulkhead was severely damaged or destroyed. Boardwalks were damaged and roadways and streets were blocked by sand and debris. Waterfront business establishments and residences were undermined. A total of 1,544 residences and business establishments were damaged by flooding, and of those, 138 residences were damaged structurally by wave action or floating debris. The City's water and gas systems failed. No general evacuation was necessary, however.

Tidal flooding caused by the storm covered most of Absecon Island. Flood waters attained a maximum depth of about 5 feet over the streets of the northeastern section of Atlantic City which necessitated evacuation of residents in that area. Power failures were reported in various areas on the island. Approximately 11,750 dwellings and 729 commercial establishments sustained damage from flooding and wave action. Although damage to the beaches was minor, the total flood damage in this reach was about 20 percent of all damages that occurred in the state. Three persons lost their lives in Atlantic City as a direct result of the storm.

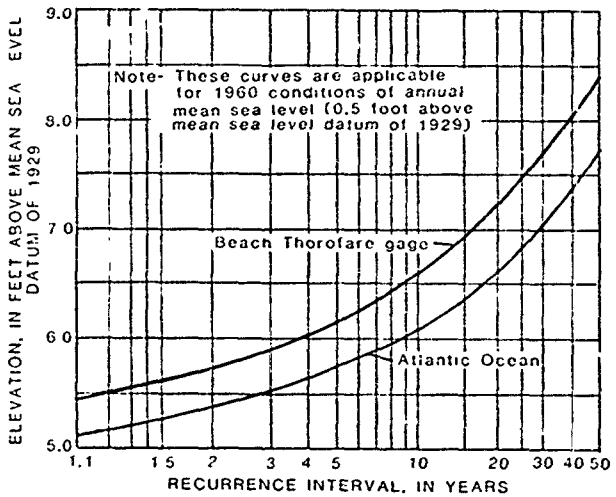
The inland communities most affected were Absecon, Pleasantville, West Atlantic City (Egg Harbor Township), and Somers Point. Flood depths up to 2 feet were experienced in Absecon and 3 feet of water covered portions of Somers Point. A total of 207 residences and 77 business places were damaged by tidal flooding.

1.8.3 STORM TIDE FREQUENCY

A statistical evaluation of tidal records was undertaken by Thomas and Edelen (1962) to determine the recurrence interval for storm high tides at Atlantic City. These data are summarized in Figure 1-10.

1.9 EFFECTS OF MAN

Mapping of the study area in 1885 indicates its first stages of development. Atlantic City was confined to the region north of present day California Avenue and east of Fairmont/Madison/Baltic Avenues. Limited development in Margate was located between Jefferson and Union Avenues east of Monmouth Avenue. In Longport, there was a small area of development from 18th to 20th Streets. Rail corridors between Pleasantville and Atlantic City were established in the form of three rail lines belonging to the Camden and Atlantic Railroad, the Philadelphia and Atlantic City Railroad, and the West Jersey and Atlantic Railroad. There was also a roadway link between the barrier beach area and the mainland.



FREQUENCY OF STORM TIDES **Figure 1-10**

The only land link between Atlantic City, Margate. and Longport was a single tract belonging to the South Atlantic Railroad. No development was present in wetlands along the road and rail lines across the bays and no piers extended from developed areas into the ocean.

Most of the major man-made physical changes to the area occurred between 1885 and 1924. During this period, development expanded along the entire length of the barrier island from Atlantic City to Longport. In Longport and south Margate, development spread from shore areas to Beach Thorofare. In Atlantic City, extensive filling occurred along its northwest edge including the area known as Venice Park. Construction of Absecon Boulevard and a highway connection beween Somers Point and Longport further linked the island to the mainland. The mainland's three country clubs and Brigantine Boulevard were also completed during this period. Six piers extended into the ocean: Heinz Pier, Garden Pier, Steel Pier, Steeple Chase Pier, Central Pier, and Young's Million Dollar Pier.

During the next 12 years, construction of the Ocean City Coastal Highway Bridge, the highway connecting Margate and Northfield, the dead-end canals at the ends of Sumner and Osborne Avenues, the Intracoastal Waterway, and the dead-end canals in Margate at the ends of Dover and Trenton Avenues was completed. Delta Basin and Gardner's Basin on the western side of Atlantic City were also defined. By 1949, Absecon Island was essentially as it is today with the exception of completion of the Atlantic City Expressway in 1964. By 1949, Brigantine was also well developed with the exception that development extended only about six blocks south of the junction of Absecon and Brigantine Boulevards. By 1964, development on the southern end of Brigantine extended fourteen blocks further south and was also prevalent on the peninsula.

Chapter 2
BIOLOGICAL PROFILE

2.1 PURPOSE

The purpose of the Biological Profile is to describe the study area's major habitat types, discuss their biological value, and present an inventory of the plant and animal species associated with them.

2.2 INTRODUCTION

The biological value of wetlands is recognized in the regulations of the Corps (33 CFR 320 *et seq.*) which state that:

- Wetlands are biologically productive;
- Wetlands serve important biological functions including providing nesting, spawning, and resting sites for aquatic and land species;
- Wetlands shield other areas from wave action, erosion, and storm damage;
- Wetlands serve as storage areas for storm and flood waters;
- Wetlands are prime natural recharge areas; and
- By natural processes of filtration, wetlands purify water.

Although wetlands are unusually productive biotic communities, the New Jersey Department of Environmental Protection cites sobering statistics concerning New Jersey's loss of wetlands ("An Inventory of the New Jersey Coastal Area," 1975). In the twenty years between 1953 and 1973, 24 percent of New Jersey's wetlands were lost to development. The loss in Atlantic County was approximately 11 percent or 5,000 acres. Although a significant portion of New Jersey's wetlands have been irreversibly converted to other uses, considerable wetland acreage remains. Atlantic and Cumberland Counties have the highest percentage of remaining wetlands, each with approximately 21 percent of the State's total.

2.3 ECOLOGICAL CONCEPTS

The following section, adapted from John Clark's book, *Coastal Ecosystems*[1], reviews certain ecological concepts which are important in understanding the biological value of wetlands. The concepts reviewed below include:

- Primary productivity,
- Energy and the food chain,
- Biotic systems,
- Estuarine dependence,
- Diversity, and
- Ecotone.

[1]*Coastal Ecosystems*, 1974, is copyrighted © by the Conservation Foundation. The material presented in this study is here by permission of John Wiley and Sons, Inc., 605 Third Avenue, New York, New York.

2.3.1 PRIMARY PRODUCTIVITY

The concept of primary productivity refers to the capacity of an ecosystem to produce plant material. Primary productivity is the amount of energy converted from light, nutrients and carbon dioxide to plant tissues within a unit of area during a unit of time; for example, the grams of carbon fixed per square meter per day. In terms of primary productivity, estuarine water bodies may produce 20 times as much as the deep sea and 10 times as much as either nearshore waters or deep lakes. Primary productivity governs an ecosystem's total capacity for life

Productivity measures are useful in understanding the sources of energy that fuel an ecosystem. They are also helpful in diagnosing the conditon of an ecosystem because they are a measure of its potential capacity to support life. By comparing actual abundance of life with the potential abundance, one can determine if a system is malfunctioning and needs attention.

2.3.2 ENERGY AND THE FOOD CHAIN

The energy needs of coastal ecosystems are met in two ways: from external driving forces, and from internal supplies that are recycled within the system. The major external driving forces of coastal ecosystems are tide, ocean current, river inflow, wind, sunlight and the basic inorganic nutrients that nourish plants and animals. Internally, the food chain begins with energy assimilated by plants. Plants, the producers, use the energy of sunlight in photosynthesis to transform carbon dioxide and basic nutrients into plant tissue, a form of energy which is available to animals as their basic foodstuff. Because all animal food starts with plants, they are ultimately affected by those factors that limit the building of plant tissue such as the supply of nutrients, the amount of carbon dioxide available, and access to sunlight.

2.3.3 BIOTIC SYSTEMS

The complexity of biotic systems emphasizes the need for an ecosystem approach in coastal management and reinforces the principle that coastal ecosystems must be managed in respect to the entire system.

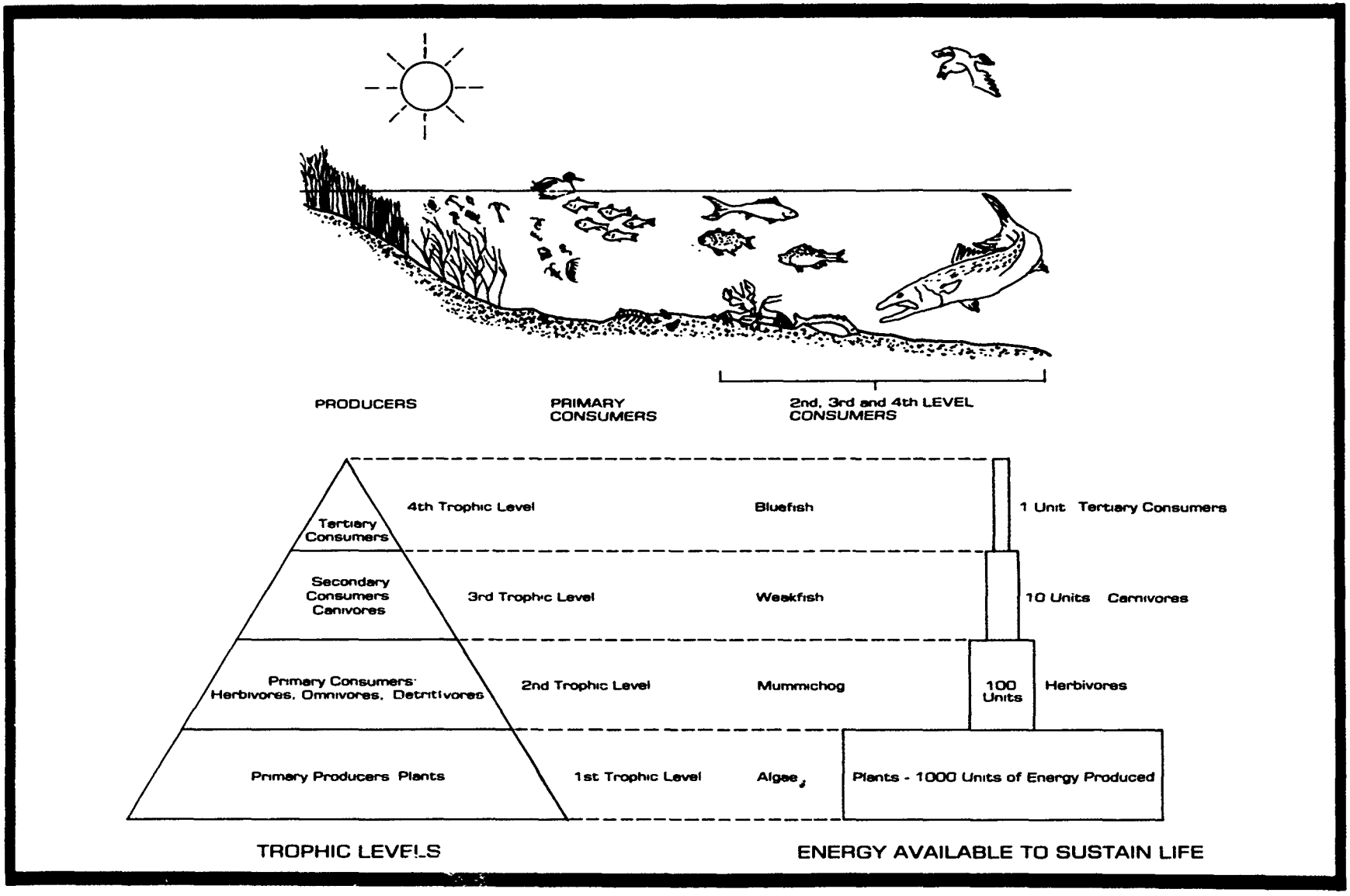
The biota of coastal ecosystems includes a wide variety of plants, birds, fish, mammals and invertebrate organisms. Life is not only important for what it yields directly to mankind, but for the way it serves to keep the whole coastal water system in order. In its natural condition, an ecosystem incorporates a balanced network of biotic inter-relationships.

The life system of an estuary begins with plant life—marsh grass, submerged bottom plants, and masses of drifting phytoplankton. Some of the plant material is consumed directly by shellfish and fish, but more often it is eaten by zooplankton, tiny floating animal life, which become the food of fishes and other organisms. The fish, in turn, are consumed by larger species including birds, other fish, and man. This transfer of food energy from lower to higher forms, known as the food chain, is comprised of a number of separate components. See Figure 2-1. Plants are the producers and occupy the first trophic level. Plant-eating animals, herbivores, are consumers and occupy the second trophic level. Those that prey on consumers occupy the third trophic level and are known as predators. In certain instances, a predatory species may occupy a fourth trophic level, but the amount of energy available at this level of the food chain confines it to relatively few species. Finally, there are the decomposers, such as bacteria and fungi, that reduce dead matter into reuseable forms.

Detritus, particles of decaying plants and other organic material, is transported throughout the ecosystem to become an important nutrient element in the diet of many species. Much of the food of smaller aquatic animals is derived from digesting the bacteria and other microorganisms that live on floating particles of detritus. The detritus is swallowed, the bacteria are digested, and the particles passed back to the water where new layers of bacteria form to nourish other animals. In addition to being a source of food, the essential role of bacteria is to reduce dead plants and animals into basic minerals, nitrates, phosphates. and other components which provide the nutrient supply for a new cycle of plant life.

2.3.4 ESTUARINE DEPENDENCE

Of the hundreds of species of coastal fishes, the most important for commerce and sport are often migratory species that depend on



THE BASIC FOOD CHAIN

Figure 2-1

estuaries to fulfill special needs. Without close study one might not link such species as bluefish, mackerel or channel bass to estuaries, or realize how very dependent the early lives of menhaden, striped bass and croaker are upon brackish tidal rivers. Walford et al. have summarized this link as follows:

> "One group of migrant Atlantic fishes spends summer in the estuaries and winter off-shore in deep waters; for example, croaker (hardhead) and spot (lafayette) do this. Others, such as the winter flounder, prefer deeper waters in summer and spend winters in the estuaries. Anadromous species such as salmon, shad, alewife (river herring) and striped bass come in from the ocean to go up the rivers for spawning. Catadromous species, such as the eel, live in fresh and brackish waters but spawn in the sea, but the young return through the estuaries to fresh waters."

A few important species such as the white perch and spotted sea trout reside permanently within the protective waters of estuaries. Some migratory sea fish such as weakfish, redfish, mullet, and black drum spawn inside the protected waters of the estuary, In total, some 60-70 percent of Atlantic and Gulf Coast species of fish are estuarine dependent.

2.3.5 STORAGE

Storage capacity is an exceptionally important aspect of the coastal ecosystem. Storage is the capability of a system to store energy supplies in one or more of its components. Such a storage unit can be a stand of marsh grass, a school of fish, a seed, or organic sediment. All these units gather and store a supply of energy which is a reserve against shortages. Storage is nature's hedge against boom-or-bust fluctuations of abundance and scarcity; a high capability for energy storage provides for optimum ecosystem function.

The contribution of plant tissue is particularly important because it provides a reserve of nutrients which stabilizes the system. Marsh grass including its roots, leaves, flowers, and stems provides storage upon which the regularity of nutrient supply to the estuarine food chain depends.

2.3.6 DIVERSITY

Diversity expresses the variety of species present in an ecosystem. It is generally assumed that a high diversity of species leads to better ecosystem balance and provides a greater resilience to catastrophic events such as disease. Conversely, a low diversity may indicate a stressed or degraded system.

2.3.7 ECOTONE

An ecotone is the transition area at the edge or border of two different communities, as between a marsh and a forest. Ecotones combine the characteristics of the communities they separate and, while limited in size, they often have an unusually high abundance and diversity of life.

2.4 MAJOR HABITAT TYPES

The major habitat types within the study area are divided into five areas:

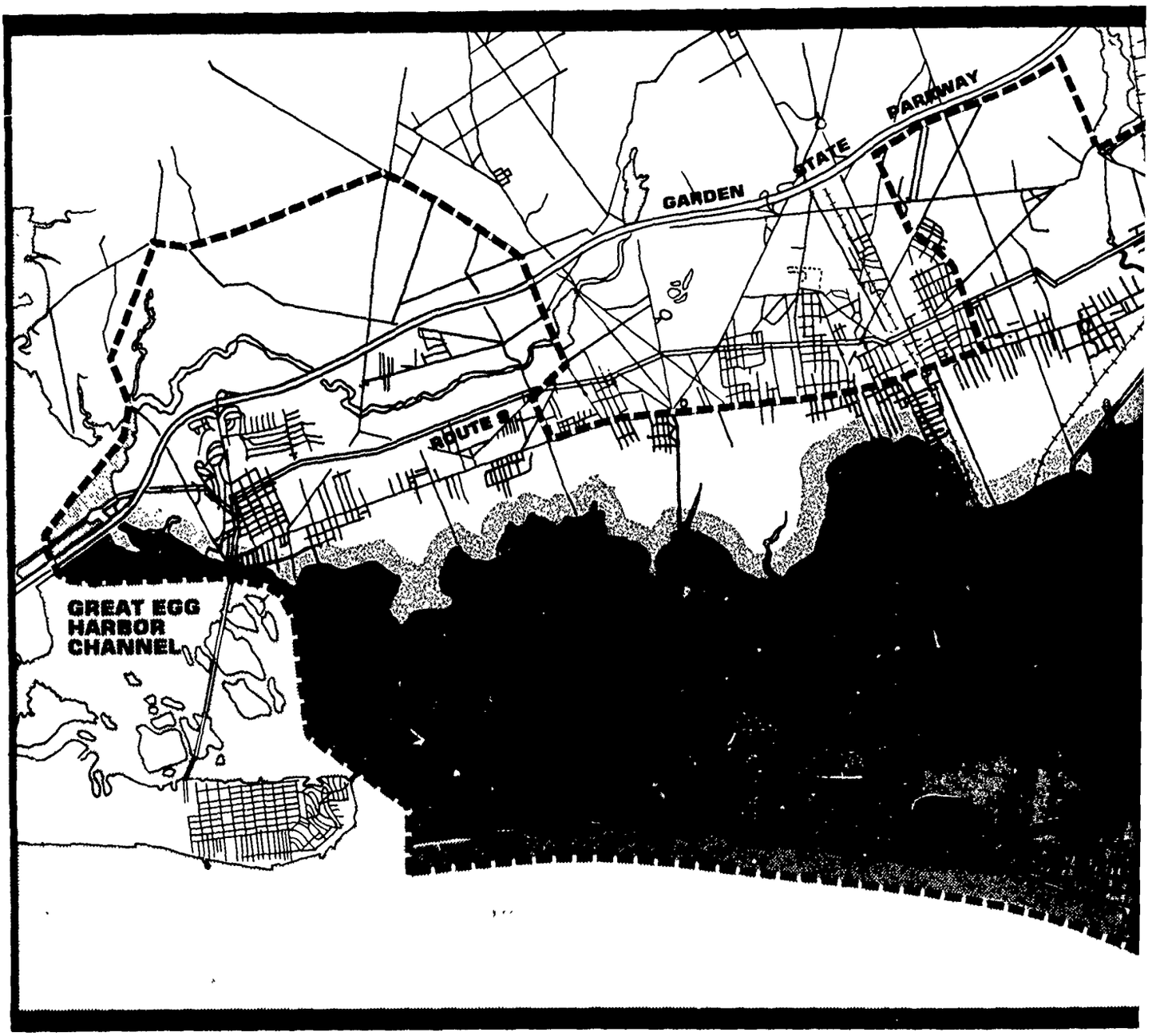
- Ocean (Nearshore Coastal),
- Barrier Islands,
- Back Bays,
- Mainland, and
- Upland-Wetland Transition Zone (See Figure 2-2).

Each of the areas is briefly discussed below.

2.4.1 OCEAN (NEARSHORE COASTAL)

The study area includes only the narrow edge of the ocean to a distance of 1,500 feet from the shore. The maximum depth of the waters within this band is approximately 20 feet.

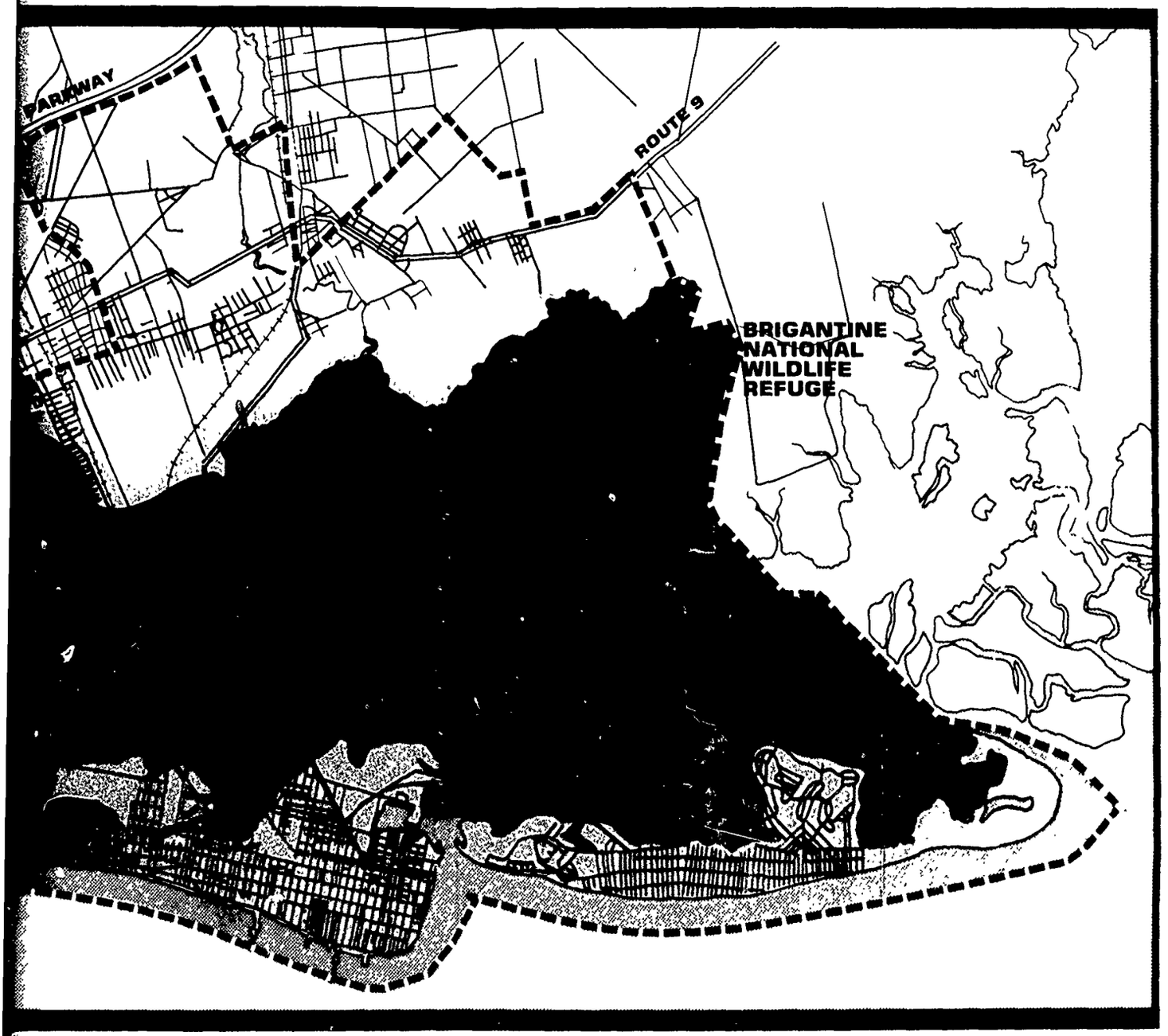
The shallow waters of the nearshore coastal area are rich in phytoplankton and zooplankton, microscopic plant and animal life



Atlantic City Area Wetlands Review

0 1 2MI
0 1 2 3 4KM

OCEAN
BARRIER ISLAND/BEACHFRONT
BACK BAY
UPLAND—



STYLIZED VIEW OF MAJOR HABITAT TYPES

BACK BAYS/COASTAL SALT MARSH

UPLAND

UPLAND—WETLAND TRANSITION

Figure 2-2

which serve as nourishment for larger and often commercially important species. They are also prime habitat for molluscs and finfish.

2.4.2 BARRIER ISLANDS

Located along the oceanfront of the study area's two barrier islands, Absecon Island and Brigantine Island, is the intertidal zone, an area demarcated by the rise and fall of the tides. The intertidal zone is an area of extremes. Composed almost entirely of sand, it is exposed to the pounding of the surf, subject to fluctuating water levels, and constantly rearranged by the forces of waves, near-shore currents, and other physical phenomena. As a result of these and other factors, the shape of the intertidal zone is forever changing, sometimes imperceptively, sometimes dramatically as during a storm.

The diversity of larger organisms living in the sands of the intertidal zone is low. The mole crab *(Emerita talpoida)* is one of the animals successfully adapted to this stressful environment. Beach hoppers (amphipods) and sand worms *(Nereis spp.)* are also among the larger inhabitants of this zone. Lodged among the particles of sand, however, are smaller forms such as bacteria which play an important role in the breakdown of detritus and the release of nutrients.

The barrier islands are the mainland's primary protection against the forces of the sea. Like the intertidal zone, they change as a result of the natural processes of erosion[1] and accretion[2]. This dynamic aspect of the islands often interferes with man's attempts to stabilize them.

The plant communities of the barrier islands are influenced by the height and width of the islands' dunes. Dunes affect the amount of salt spray and soil movement available to more interior portions of the islands. They also influence soil moisture and soil salinity. Among the plants that colonize dunes, beachgrass *(Ammophila breviligulata)* is usually prevalent. In addition to binding the sand with its roots, beachgrass aids dune growth by trapping sand particles among its leaves. In the interior portions of the islands where physical stress is less severe, the plant community is more diverse. Within the study area, however, only the northern end of Brigantine Island remains in its natural state. Here, sumac *(Rhus spp.)*, common reed *(Phragmites australis)*, bayberry *(Myrica pensylvanicum)*), poison ivy *(Rhus radicans)*, marsh-elder *(Iva spp.)*, various grasses, herbs, and shrubs form the island's remaining natural ground cover. At lower elevations on the islands' western side, wetland plants intermix with species more suited to drier conditions. Groundsel-tree *(Baccharis halimifolia)*, saltmeadow cordgrass *(Spartina patens)*, sedges, rushes, and other species indicate the presence of the transition zone between the barrier islands and the marshes behind them.

In their natural state, barrier islands provide habitat for a large variety of birds, mammals, and other animals. In their altered form, however, this aspect of the islands largely disappears.

2.4.3 BACK BAYS

Between the barrier islands and the mainland are the back bays' extensive salt marshes. Centuries in the making, these marshes continue to evolve in response to the forces of waves, currents, storms, rise in sea level, and other natural and unnatural forces (Figure 2-3).

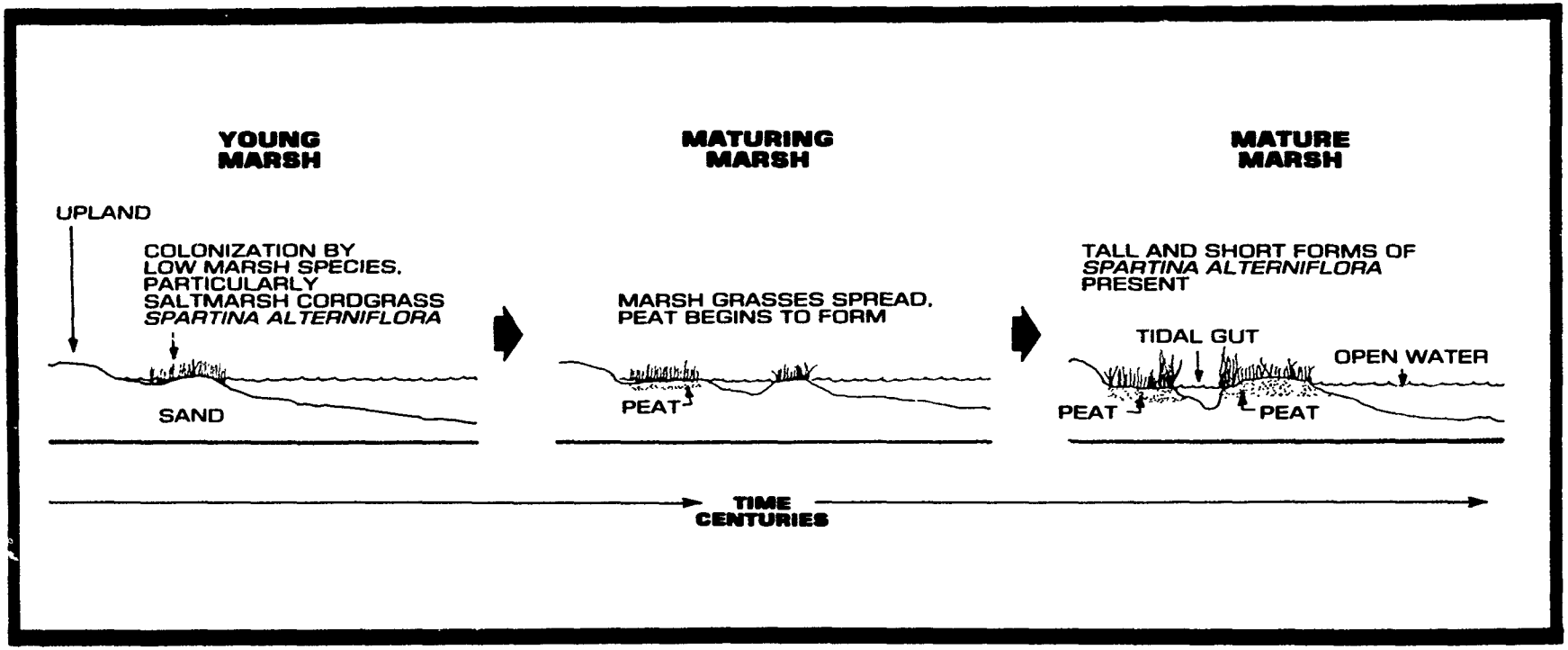
Moving from the barrier islands toward the mainland, the back bay forms a pattern typical of that outlined below (See Figure 2-4):

1. The western side of the barrier island slopes gently from upland reaches to a transition zone between the dune and the marsh.

2. The transition zone merges with the high marsh on its lower side. Plants typical of this zone include both upland and marsh species such as marsh-elder, groundsel-tree, poison ivy, saltgrass saltmeadow cordgrass, seaside goldenrod (*Solidago sempervirens*), sumac, common reed, and various sedges and grasses.

3. Slightly lower in elevation than the transition zone is the high marsh. Typically dominated by saltmeadow cordgrass and

[1] Erosion - The process by which the surface of the earth is worn away by the action of water, wind, waves, and other forces.
[2] Accretion - The process of growth or enlargement by external accumulation.

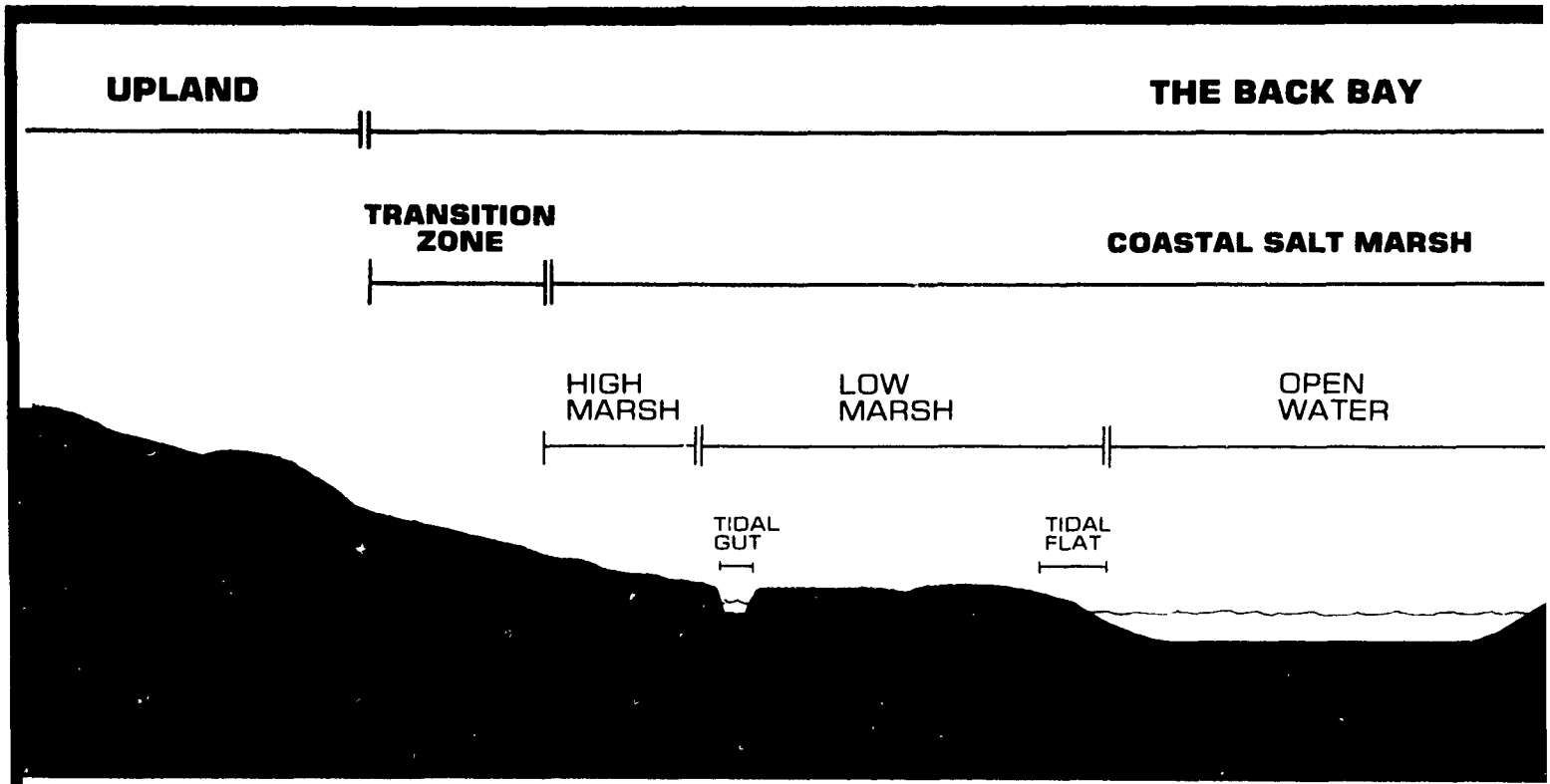


MARSH DEVELOPMENT **Figure 2-3**

saltgrass *(Distichlis spicata), the high marsh is also the location of salt hay meadows. The high marsh is typically flooded by spring high tides which occur periodically throughout the year.*

4. Lower in elevation than the high marsh is the low marsh which supports almost monotypic stands of saltmarsh cordgrass (*Spartina alterniflora*). See Figure 2-5.
5. Located on the marsh are small barren areas known as salt pannes[1]. Lacking vegetation due to the presence of excessive salt concentrations or to the past effects of wrack covering the marsh, salt pannes generally revegetate with *Salicornia* spp.
6. Throughout the marsh are waterways ranging in size from small guts, to larger creeks, to substantial channels. These routes of water passage are important as transporters of tidal waters rich in nutrients, organic material, and a vast array of living organisms.
7. Along the edge of tidal waterways, saltmarsh cordgrass grows taller than it does on the higher marsh. This more robust form of the plant is known as "high vigor" *Spartina alterniflora*. Similarly, the shorter version of the same species is known as "low vigor" *Spartina alterniflora*. The taller form

[1]Panne - Small, shallow depressions which occur on the higher marsh.



TEXT REFERENCED NUMBERS 9 8

SPECIES O
MAJOR ECOLOGICAL

UPLAND

Pine	*Pinus* spp
Cedar	Eastern Redcedar *Juniperus virginiana*
Oak	*Quercus* spp.
Sumac	*Rhus* spp.
Holly	American Holly *Ilex opaca*
Blueberry	*Vaccinium* spp.

TRANSITION ZONE

Groundsel-tree	*Baccharis halimifolia*
Marsh Elder	*Iva frutescens*
Sea-Blite	*Sueda Maritima*
Saltgrass	*Distichlis spicata*
Bayberry	*Myrica* spp.
Poison Ivy	*Rhus radicans*
Marsh Hay	*Spartina patens*
Glasswort	*Salicornia* spp.
Sea Lavender	*Limonium carolinianum*
Common Reed	*Phragmites australis*

SALT MEADOW

Marsh Hay	*S patens*
Saltgrass	*D spicata*
Glasswort	*Salicornia* spp

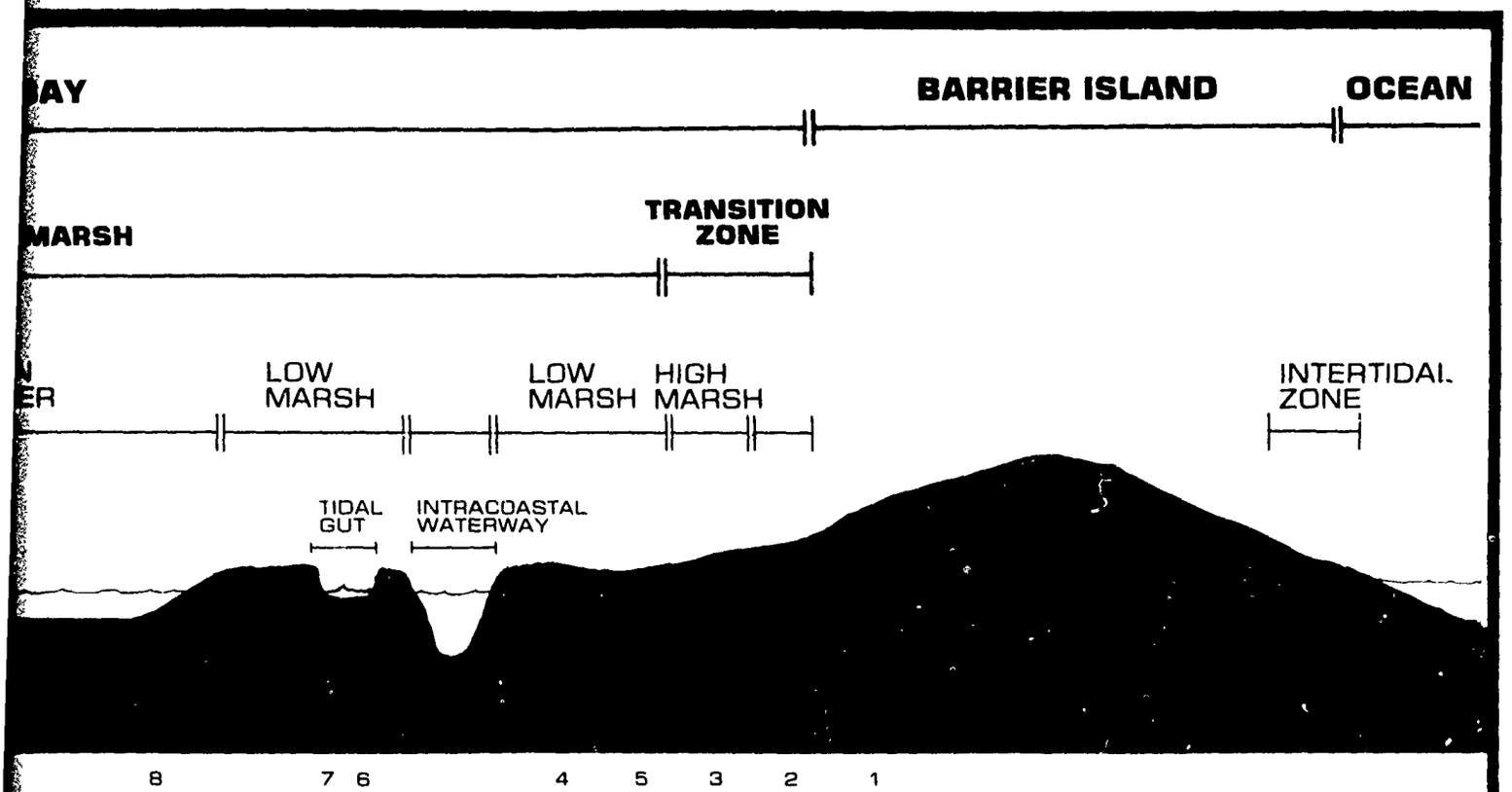
TIDAL FLAT

Sea Lettuce	*Ulva lactuca*
Eelgrass	*Zostera marina*
Algal Species	
Other	

LOW M

Saltmars	
Cordgra	

MAJOR HABITAT TYPES AND THEIR DOMINANT PLANT SPECIES



SPECIES OF COLOGICAL SYSTEMS

LOW MARSH

Saltmarsh Cordgrass	*Spartina alterniflora*

TRANSITION ZONE

Groundsel-tree	*B. halimifolia*
Marsh Elder	*Iva frutescens*
Bayberry	*Myrica* spp
Saltgrass	*D spicata*
Sea-Blite	*Sueda maritima*
Glasswort	*Salicornia* spp.
Poison Ivy	*R radicans*
Common Reed	*P australis*

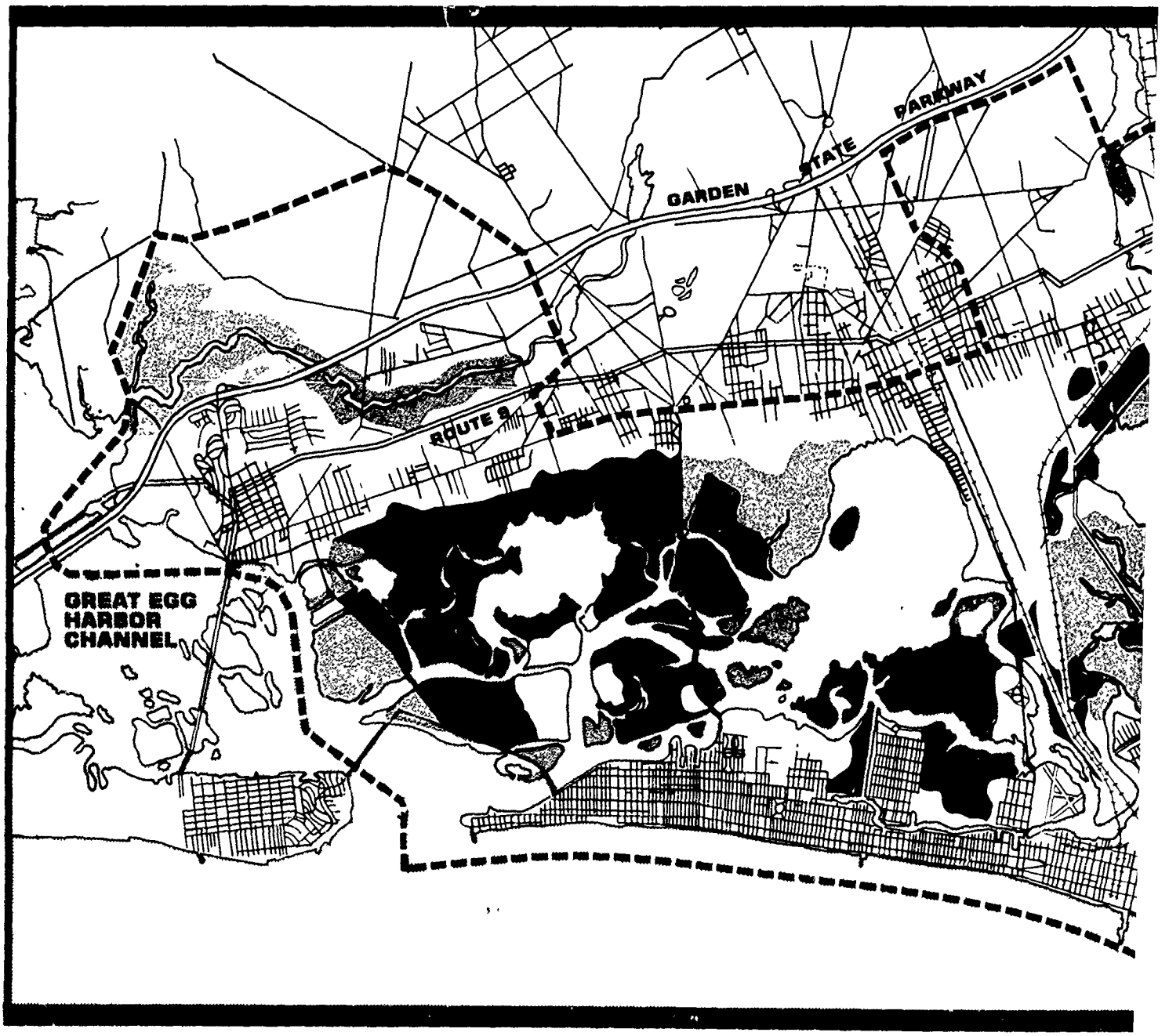
BARRIER ISLAND

Beachgrass	*Ammophila* sp
Sea-Rocket	*Cakile edentula*
Seaside Goldenrod	*Solidago sempervirens*
Poison Ivy	*R radicans*
Groundsel-tree	*Baccharis halimifolia*
Marsh Elder	*Iva frutescens*

OCEAN

Marine Algae and Fungi

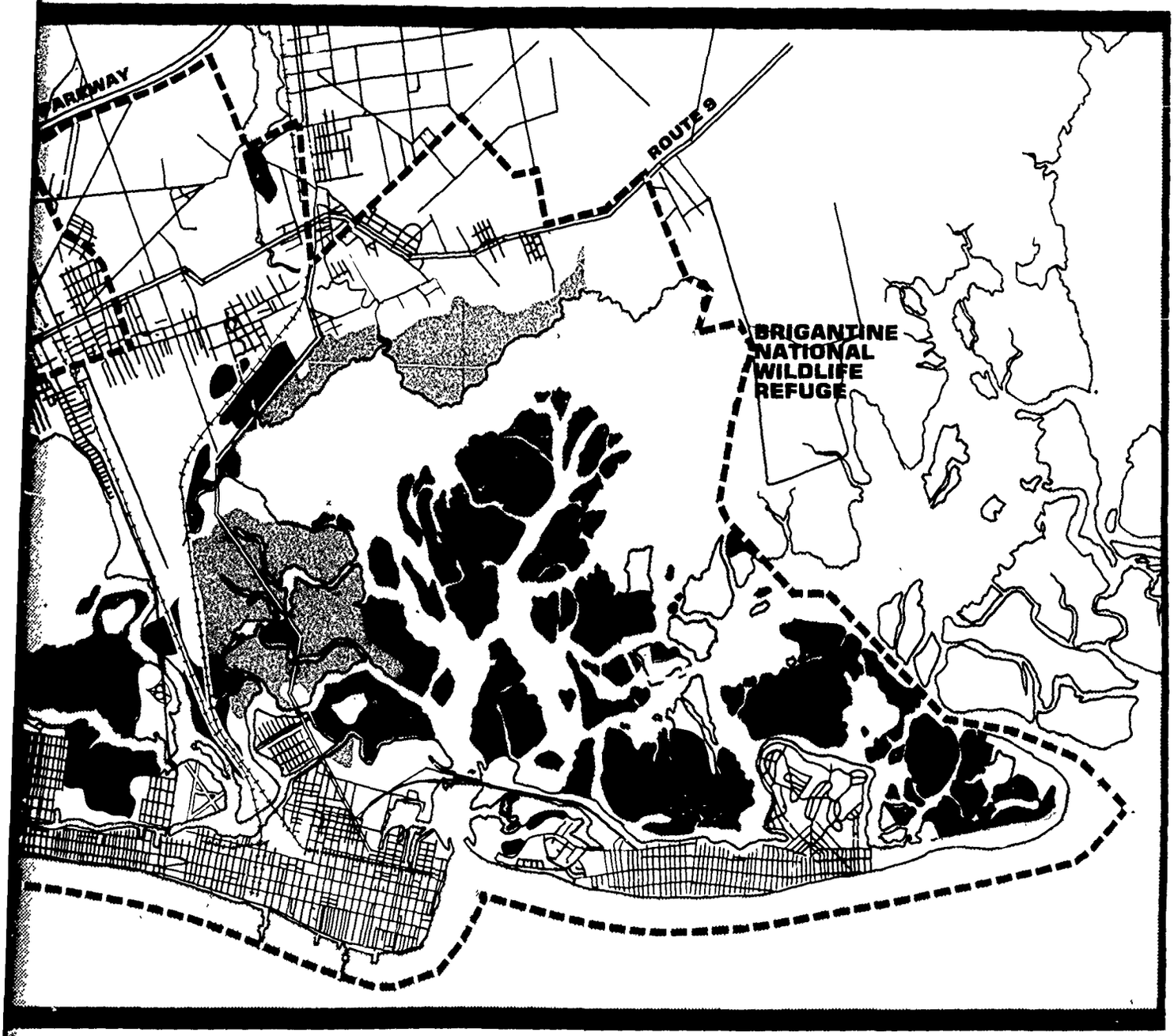
Figure 2-4



Atlantic City Area Wetlands Review

0 1 2MI
0 1 2 3 4KM

Even Mix
High Vigor/Bare Ground
High Vigor
Low Vigor



DISTRIBUTION OF SPARTINA ALTERNIFLORA
(Saltmarsh Cordgrass)

High Vigor

Low Vigor

Figure 2-5

is a major producer of organic material which nourishes the estuary's primary consumers. Both forms provide a substrate for the growth of algae, diatoms, and other microscopic organisms; serve as habitat for invertebrates such as salt-marsh snails*(Melampus bidentatus and Littorina irrorata)*, grass shrimp *(Palaemonetes vulgaris)*, ribbed mussels *(Modiolus demissus)*, fiddler crabs *Uca spp.)* and amphipods; and provide nursery, feeding, spawning and nesting areas for a variety of fish and wildlife species.

8. Channelward of the marsh, large tidal flats are often present. Covered with water at high tide and exposed at low tide, tidal flats are important areas of algal growth and as nursery areas for many species of fish, molluscs, and other organisms. They are also important as producers of fish and wildlife food organisms such as amphipods, isopods, polychaete worms, blue crabs *(Callinectes sapiduo)*, snails, clams, grass shrimp, and sand shrimp *(Palasmonetes vulgaris)*.
9. Beyond the tidal flats are the open waters of shallow bays; Reeds Bay, Absecon Bay, Lakes Bay, and Sculls Bay being the most outstanding. Serving functions similar to the tidal flats, the bays are perhaps best known as prime habitat for molluscs, especially the hard shell clam *(Mercenaria mercenaria)* and soft shell clam *(Mya arenaria)*, for crustaceans such as the blue crab, and as nursery areas for finfish.
10. Although the back bays tend to follow the pattern described above, deviation from this pattern is present, particularly in regard to disturbed areas.

There is a similar progression of forms and succession of species on the mainland side of the shallow bays except in reverse order. Unlike the island configuration of the middle part of the back bays, wide areas of vegetated marsh adjoin the mainland.

2.4.4 MAINLAND

The mainland is primarily upland habitat with the exception of Patcong and Absecon Creeks and their adjacent wetlands. Within this portion of the study area, the plant communities range from unmodified coastal forest to highly modified agricultural lands. Some of the major plant species found within the study area's forests are presented in Table 2-1.

Table 2-1 MAJOR SPECIES OF THE STUDY AREA FORESTS

Pitch Pine	*(Pinus rigida),*
Scrub pine	*(Pinus virginiana),*
Short Leaf Pine	*(Pinus echinata),*
Black Oak	*(Quercus velutina),*
White Oak	*(Quercus alba),*
Red Oak	*(Quercus rubra),*
Scrub Oak	*(Quercus illicifolia),*
Post Oak	*(Quercus stellata),*
Chestnut Oak	*(Quercus prinus),*
Black Jack Oak	*(Quercus marylandica),*
Sassafras	*(Sassafras varifolium),*
White Birch	*(Betula papyrifera),*
Sheep Laurel	*(Kalmia angustifolia),*
Mountain Laurel	*(Kalmia latifolia),*
Blueberry	*(Vaccinium corymbosum),*
Huckleberry	*(Gaylussacia dumosa),*
Inkberry	*(Ilex glabra),*
Sumac	*(Rhus copallina),*
Poison Ivy	*(Rhus radicans)*
Lichen	*(Cladonia vulcania),*
Wintergreen	*(Gaultheria procumbens),*
Bearberry	*(Arctostaphylos uvaursi),*
Leafy Spurge	*(Euphorbia esula),*
Sweet Fern	*(Comptonia peregrina),*
Prickly Pear	*(Opuntia humifusa),*
Bracken Fern	*(Pteris aquilina),*
Turkey Beard	*(Xerophyllum asphodeloides),*
Jointweed	*(Plygonella articulata),*
Wooly Hudsonia	*(Hudsonia tomentosa),*
Partidgeberry	*(Mitchella repens),*
Tree Moss	*(Climacium dendroides),*
Club Moss	*(Lycopodium obscurum), and*
Christmas Fern	*(Polystichum acrostichoides).*

Source Joseph L. Lomax, Jnseph L. Lomax and Associates, Box 231, Cape May Court House, New Jersey.

2.4.5 UPLAND-WETLAND TRANSITION ZONE

The upland-wetland transition zone contains species that are representative of both upland and wetland habitats types. Like other ecotones, the upland-wetland transition zone contains a high diversity of species which intermingle as a consequence of the area's irregularities of elevation, drainage characteristics, and other physical and biological characteristics. In certain areas which have been modified by man, the transition zone has been altered or eliminated. This is the case along the back bays where development extends to the edge of the marsh. In these locations, the benefits of having a natural buffer between marsh and upland areas are reduced or nonexistent. During storm events, structures occupying locations adjacent to the marsh may suffer from the loss of the upland-wetland transition zone.

2.5 ANIMAL LIFE WITHIN THE STUDY AREA

The inventory of the study area's animal life is divided into the following categories:

- *Benthic[1] invertebrates[2]*,
- Shellfish,
- Finfish,
- Colonial seabirds,
- Waterfowl,
- Mammals,
- Reptiles and amphibians, and
- Endangered or threatened species.

See Figure 2-6.

[1] *Benthos (Benthic) - A collective term describing (1) bottom organisms attached to or resting on or in bottom sediment; (2) the community of animals living in or on the bottom of a water body.*

[2] *Invertebrate -Any animal lacking a backbone such as insects, spiders, crustaceans, worms, and molluscs.*

2.5.1 BENTHIC INVERTEBRATES

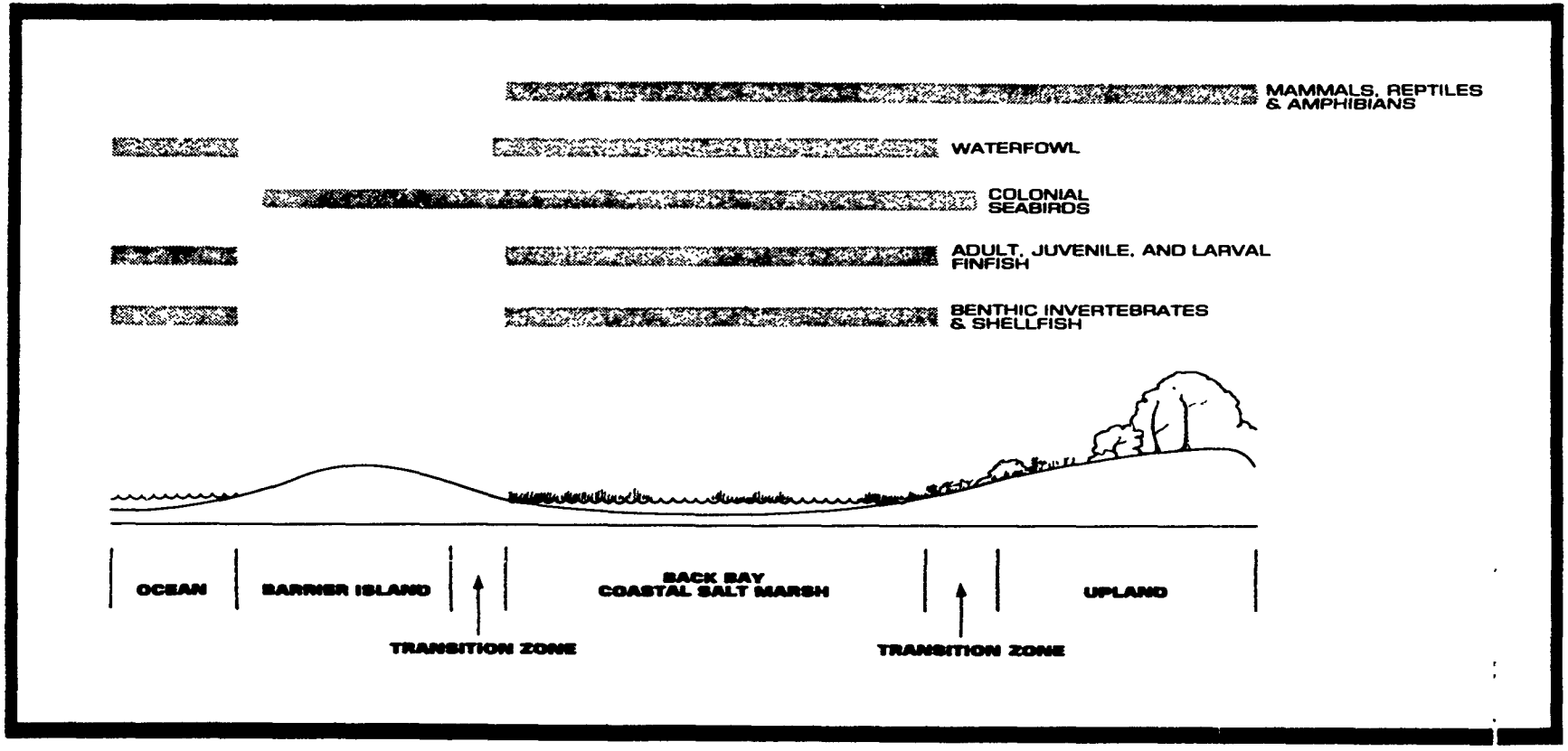
This section reports only the preliminary results of a study on the effects of dredged material disposal on benthic populations within a portion of Absecon Bay. Durand (1976) identified 83 species of benthic invertebrates from samples taken within the project study area. Of these, 15 were molluscs, 28 were crustaceans, 35 were polychaetes, and 5 were from other groups. In the control area, *Ampelisca abdita* (an amphipod) dominated and occurred at all stations. The polychaetes (worms) *Streblospio benedicti, Scoloplos fragilis,* and *Polydora ligni* also occurred at all stations. *Streblospio benedicti, Scoloplos fragilis* (polychaetes), and *Ampelisca abdita* (amphipod) were present in all five of the stations in the dredged material disposal area. In the channel, a disturbed area, *Streblospio benedicti* was the only species found at all stations.

NOTE: *Additional information on the water quality, fish, ichthyoplankton, benthos, and recreational use of the study area may be found in "Studies of the Back Bay System in Atlantic County," Final Report, 1979, Misc. Report No. 47M, prepared by NJDEP, Division of Fish, Game and Wildlife.*

2.5.2 SHELLFISH

The back bays and shallow ocean waters contain extensive and highly productive shellfish beds. Data for hard clam landings in the back bays (Table 2-2) are indicative of this high level of productivity (Tom McCloy, personal communication, 1978). Although a portion of the study area is condemned for the taking of shellfish, licensed clammers are allowed to relay clams to Great Bay where they cleanse themselves in its purer waters. This process has enabled fishermen to harvest clams between 1970 and 1975 with a market value of $927,244 (McCloy, 1977). Conditions for shellfishing in the study area have improved, and are likely to continue to improve, due to implementation of the regional sewage treatment facility in November, 1978.

Large beds of surfclams (*Spisula solidissima*) are found offshore the barrier islands.



REPRESENTATIVE CROSS SECTION OF THE STUDY AREA ILLUSTRATING THE OCCURRENCE OF MAJOR FAUNAL GROUPS

Figure 2-6

2.5.3 FINFISH

Partly as a result of the diversity of habitats and of the high biological productivity of the back bays, many species of fish are found in the study area. Table 2-3 indicates those species caught in gill, seine, and trawl sampling of the study area's back bays.

The bay anchovy, an important food of many sport and commercial fish, was present at all trawl stations and was dominant in six. Spot, weakfish, and windowpane, along with red hake, winter and smallmouth flounder, oyster toad fish, and Atlantic silverside were all numerically important. The seine samples were dominated by the Atlantic silverside at all stations except one. Mummichog, spot, bay anchovy, and sheepshead minnow were also prevalent.

Table 2-2 **HARD CLAM LANDINGS FROM CONDEMNED WATERS WITHIN THE ATLANTIC CITY AREA***

Year	Area Harvested	Principal Harvest Method	No. Clams	Men/day	Clams/day	Clams/ man/day
1970	Lakes Bay	Raking	3,000,000	29.7	111,111	3,741
1971	Lakes Bay	Raking	4,893,000	17.0	116,500	6,852
1972	Lakes Bay	Raking	3,409,500	11.2	57,788	5,159
1973	Absecon Bay - Scull Bay	Raking	6,964,650	24.0	139,293	5,804
1974	Absecon Bay - Scull Bay	Raking	3,303,000	18.0	56,948	3,164
1975	Ocean City - Reed Bay	Wading	5,113,200	25.5	82,471	3,234

*New Jersey Department of Environmental Protection, Division of Fish, Game and Wildlife, December 1977, Miscellaneous Report No. SF-1.1

Mr. Pete Himchack, NJDEP, provided icthyoplankton[1] data from stations sampled between March and October, 1977. A list of species from these collections is given below:

Icthyoplankton Species Caught in the Back Bays of the Study Area March-October, 1977

American sand lance	*Ammodytes americanus*
American eel	*Anguilla rostrata*
Weakfish	*Cynoscion regalis*
Naked goby	*Gobiosoma bosci*
Atlantic silverside	*Menidia menidia*
Northern pipefish	*Syngnathus fuscus*
Winter flounder	*Psuedopleuronectes americanus*
Oyster toadfish	*Opsanus tau*
Minnows	*Cyprinidae*
Bay anchovy	*Anchoa mitchilli*
Northern stargazer	*Astroscopus guttatus*
Anchovies	*Anchoa spp.*
Lined seahorse	*Hippocampus erectus*
Sea robin	*Prionotus spp.*
Inshore lizardfish	*Synodus foetens*
Drums	*Sciaedidae*
Lefteye flounders	*Bothidae*
Filefish	*Balistidae*

[1]Icthyoplankton - Fish eggs, larvae, or juveniles which are subject to tidal movement.

The fish species and their relative abundance for the study area are similar to those reported by Icthyological Associates (1974 and 1975) for Great Bay and Brigantine National Wildlife Refuge and by Daiber (1974) for the Delaware Bay.

Table 2-3

FISH SPECIES CAUGHT IN THE BACK BAYS OF THE STUDY AREA MARCH-DECEMBER, 1977

Haddock	*Melanogrammus aeglefinus*
Mummichog	*Fundulus heteroclitus*
American sand lance	*Ammodytes americanus*
Black sea bass	*Centropristis striata*
Northern pipefish	*Syngnathus fuscus*
White hake	*Urophycis tenuis*
Spot	*Leiostomus xanthurus*
Striped sea robin	*Prionotus evolans*
Weakfish	*Cynoscion regalis*
Winter flounder	*Psuedopleuronectes americanus*
Striped killifish	*Fundulus majalis*
Americn eel	*Anguilla rostrata*
Northern sea robin	*Prionotus carolinus*
Smallmouth flounder	*Etropus microstomus*
Striped mullet	*Mugil cephalus*
Striped anchovy	*Anchoa hepsetus*
Atlantic menhaden	*Brevoortia tyrannus*
Spotted hake	*Urophycis regius*
Northern stingray	*Dasyatis sp.*
American shad	*Alosa sapidissima*
Banded killifish	*Fundulus diaphanus*
Threespine stickleback	*Gasterosteus aculeatus*
Permit	*Trachinotus falcatus*
Crevalle jack	*Caranx hippos*
Fourspine stickleback	*Apeltes quadracus*
Orange filefish	*Aluterus schoepfi*
Pollock	*Pollachius virens*
Bay anchovy	*Anchoa mitchilli*
Cunner	*Tautogolabrus adspersus*
Northern puffer	*Sphoeroides maculatus*
Smooth dogfish	*Mustelus canis*
Striped cusk eel	*Rissola marginata*
Summer flounder	*Paralichthys dentatus*
Windowpane	*Scophthalmus aquosus*
Atlantic roasker	*Micropogon undulatus*
Red hake	*Urophycis chuss*
Blueback herring	*Alosa aestivalis*
Lookdown	*Selene vomer*
Oyster toadfish	*Opsanus tau*
Striped burrfish	*Chilomycterus schoepfi*
Bluefish	*Pomatomus saltatrix*
Alewife	*Alosa pseudoharengus*
Hardtail	*Caranx crysos*
Hogchoker	*Trinectes maculatus*
White perch	*Morone americana*
Atlantic silverside	*Menidia menidia*
Sheepshead minnow	*Cypinodon variegatus*
White mullet	*Mugil curema*
Naked goby	*Gobiosoma bosci*

Source: John McClain, NJDEP, Division of Fish, Game and Wildlife

2.5.4 COLONIAL SEABIRDS AND HERONS

In a study of the New Jersey coast (Buckley and McCaffrey, 1973), 76 percent of the seabird population occupied marsh habitat and 18 percent occurred on dredged material disposal sites. Barrier islands were the least utilized habitat type. The cause of this latter observation is the extreme scarcity of this habitat type along the New Jersey coast. Most barrier islands are developed. Even on those barrier islands remaining in their natural state, disturbance by humans often drives off prospective nesting pairs.

For all species of wading birds surveyed, at least 50 percent of the nesting sites occurred on dredged material. Specific populations of great egrets *(Casmerodius albus)*, black-crowned night herons *(Nycticorax nycticorax)* and yellow-crowned night herons *(Nyctanassa violacea)* were identified on barrier islands. Dredged material islands supported a preponderance of snowy egrets *(Leucophoyx thula)* (91%), glossy ibis *(Plegadis falcinellus)* (75%), and little blue herons *(Florida caerulea)* (68%). Colonies on these sites were generally smaller on more recently created dredged material islands than on older islands. This is largely due to the limited height of vegetative cover. Of the colonies occurring within the Atlantic City area, at least 13 occur on dredged material disposal sites. The location of major nesting sites within the study area is presented in Vol. 1, Chapter 2, Figure 2-5.

Species preference for dredged material sites varied considerably. Laughing gulls *(Larus atricilla)* preferred marsh sites and dredged material islands that had been reinvaded by saltmarsh vegetation. Sixty-five percent of the great black-backed gulls *(Larus marinus)* and fifty-six percent of the herring gulls *(Larus argentatus)* occupied dredged material islands. Gull-billed terns *(Gelocheliodon nilotica)* occupied only disposal areas that had reverted to salt marsh. Common terns *(Sterna hirundo)* occupied marsh habitat almost exclusively. Least terns *(Sterna albifrons)*, limited to sandy substrates, used unvegetated dredged material islands as an alternative to barrier island beach habitat. Black skimmers *(Rynchops nigra)* were spread fairly evenly in their use of natural barrier island areas and dredged material islands.

A variety of plant communities are important to birds, notably common reed, common reed-shrub, dense grassland, shrub-dense grassland, and shrub-forest habitat.

2.5.5 WATERFOWL

Numerous waterfowl species utilize the marshes and bays of the study area as summer or winter residents, or as migrants. Each year during the first week of January, the NJDEP, Division of Fish and Wildlife, makes a count of the number of waterfowl wintering along New Jersey's coast. Waterfowl numbers recorded during the November, 1977, aerial survey are presented in Table 2-4 for the flight segments including the study area and Brigantine National Wildlife Refuge. Not surprisingly, the Brigantine National Wildlife Refuge supports the greatest waterfowl populations and the widest variety of species relative to all other areas. Reed and Absecon Bays provide habitat for the next largest number of species and are notable as the only areas utilized by scaup. The average number of waterfowl for eighteen categories during the years 1978, 1979, and 1980 are presented in Table 2-5. As indicated in both tables this segment of the New Jersey coast is an important wintering area. For the large numbers of Atlantic brant and black duck found in the study area, this is especially true.

2.5.6 MAMMALS

Studies conducted at the Brigantine National Wildlife Refuge indicate that opossum (*Didelphia marsupialis*), shorttail shrew (*Blarina brevicauda*), least shrew (*Cryptotis parva*), starnose mole (*Condylura cristata*), and masked shrew (*Sorex cinereus*) occur along streams and on the marsh near woodland. Bat species present on the refuge include the little brown bat (*Myotis lucifugus*), silver-haired bat (*Lasionycteris noctivagans*), Eastern pipstrel (*Pipistrellus subflavus*), big brown bat (*Eptescius fuscus*), and red bat (*Lasiurus cinereus*). The majority of these species have been sighted along watercourses and in wooded areas.

Upland fields and woodlands within the study area support population of Eastern chipmunk (*Tamias striatus*), Eastern cottontail (*Sylvilagus floridanus*), and several species of mice and voles. Muskrat (*Ondatra zibethicus*), raccoon (*Procyon lotor*), longtail weasel (*Mustela frenata*), and mink (*Mustela vison*) are also present. Gray fox (*Urocyon cinereoargenteus*) has been noted on colonial seabird islands within the study area, as has the river otter (*Lutra canadensis*).

2.5.7 REPTILES AND AMPHIBIANS

With the exception of the diamondback terrapin *(Malaclemys terrapin)*, the following reptiles and amphibians are adapted to upland or fresh water habitats. Turtles found within the study area include the snapping turtle (*Chelydra serpentina*); stinkpot (*Sternothaerus odoratus*); Eastern mud turtle (*Kinosternos subrubum*);

Table 2-4

WATERFOWL NUMBERS RECORDED DURING THE NOVEMBER 1977 AERIAL SURVEY

		F10 Little Egg Harbor Bay	F11 Great Bay	F13 Brigantine Refuge	F14 Reed Bay Absecon Bay	F15 Lakes Bay Scull Bay	F16 Great Bay Harbor Bay
Black Duck	*Anas rubripes*	200	1,000	10,000	2,300	1,100	400
Brant	*Branta bernicla*	1,400	1,000	2,000	400	200	
Bufflehead	*Bucephala albeola*	300	200	100		200	100
Canada goose	*Branta canadensis*	200	100	2,000	400	200	
Coot	*Fulica americana*			500			
Gadwall	*Anas strepera*			300			
Goldeneye	*Bucephala clangula*	60					
Green-winged teal	*Anas carolinensis*			14,000			
Mallard	*Anas platyrhynchos*		100	800	200	400	800
Merganser (hooded)	*Lophodytes cucullatus*			200			
Merganser (red-breasted)	*Mergus serrator*						
Mute swan	*Cygnus olor*			60			
Pintail	*Anas acuta*			800			
Scaup	*Aythya spp.*	500			100		200
Scoters	*Melanitta spp.*				20,000		
Shovelier	*Spatula clypeata*			400			
Snow goose	*Chen hyperborea*			34,000	7,000		
Widgeon	*Marela americana*		900	1,900	200		

Source NJDEP, Division of Fish, Game and Wildlife

Eastern box turtle (*Terrapene carolina*); diamondback terrapin and the Eastern painted turtle (*Chrysemys picta*). Species of snakes found in the area include the Northern watersnake (*Natrix sipedon*), Eastern garter snake (*Thamnophis sirtalis*), Northern black racer (*Coluber constrictor*), and Northern redbellied snake (*Storeria occipitomaculata*). Amphibians found in the area include the red-backed salamander (*Plethodon cinereus*), four-toed salamander (*Hemidactylium scutatum*), Fowler's toad (*Bufo woodhousei*), Northern spring peeper (*Hyla crucifer*), New Jersey chorus frog (*Pseudarcrus triseriata*), green frog (*Rana utricularia*), and Southern leopard frog (*Rana pipiens*).

2.5.8 ENDANGERED OR THREATENED SPECIES

The status of those animals in the study area that have been designated as threatened or endangered by the Federal govern-

Table 2-5

NUMBER OF WATERFOWL WINTERING IN THE GREATER ATLANTIC CITY AREA

CATEGORY		NUMBER
Canada goose	*Branta canadensis*	270
Atlantic Brant	*Branta bernicla*	9430
Snow Goose	*Chen hyperborea*	70
Mallard	*Anas platyrhynchos*	1530
Black Duck	*Anas rubripes*	5730
Pintail	*Anas acuta*	100
Gadwal	*Anas strepera*	30
Green-winged teal	*Anas carolinensis*	30
Widgeon	*Marela americana*	200
Shoveler	*Spatula clypeata*	70
Scaup	*Aythya spp.*	2730
Common Goldeneye	*Bucephala clangula*	15

CATEGORY		NUMBER
Bafflehead	*Bucephala albeola*	1170
Old Squaw	*Clangula hyemalis*	430
Merganser		370
Merganser (Hooded)	*Lophodytes cucullatus*	
Marganser (Red Breasted)	*Mergus serrator*	
Scoter	*Melanitta spp.*	770
(Common Scoter, White-winged Scoter and Surf Scoter)		
Ruddy Duck	*Oxyura jamaicensis*	30
Coot	*Fulica americana*	30
	TOTAL	23,005

NOTE

- Waterfowl numbers represent the average of three annual census flights conducted in 1978, 1979 and 1980. The census area extends from the southern border of Brigantine National Wildlife Refuge to Roosevelt Boulevard in Marmora and from approximately 1,500 feet off the coast to the vicinity of Route 9. The census area is slightly larger than the study area but the number of birds outside the study area does not add significantly to the total count.
- The number of Atlantic Brant is much lower than counts ten years ago. The reduction in population is attributed to lack of breeding success in the arctic and to severe winters in New Jersey. Ten years ago, three to four times the present number of brant overwintered in this area. The above figure represents approximately 20% of the current Atlantic Flyway population of Atlantic Brant.
- Snow Geese are prevalent in the study area as migrants.
- The major food item of Atlantic Brant is sea lettuce (*Ulva lactuca*); of all groups, especially Black Duck, marsh snail (*Melampus bidentatus*); and of Snow Geese, saltmeadow cordgrass.
- Maintenance of many of the above waterfowl species depends on the preservation of salt marsh, their principal wintering habitat.

Source. Telephone conversation between J. Steen and Lee Widjeskog, NJDEP, Division of Fish, Game & Wildlife, March 28, 1980.

ment is presented in Table 2-6. The status of those birds that occur on may occur in the study area and that have been designated as threatened or endangered by the State of New Jersey is presented in Table 2-7.

In March, 1979, the least tern *(Sterna albifrons)* and black skimmer *(Rhynchops nigra)* were added to the State of New Jersey's endangered species. An overview of each species status list is provided below:

2.5.8.1 LEAST TERN

Research and management of endangered birds was undertaken by the NJDEP, Division of Fish, Game and Wildlife, for the period from October 1, 1977 to September 30, 1978. Early June helicopter surveys revealed 14 nesting colonies of least terns along the Atlantic coast from Cape May Point in Cape May County to the northern end of Barnegat Bay in Ocean County. Six teams of cooperating biologists monitored the colonies throughout the season to assess their reproductive success and the need for habitat management and nest site protection. Of the colonies recorded during the survey eight were located in the study area.

Of an estimated 1,845 least terns, 387 young were produced in 1978. This low rate of reproductive success was attributed to the adverse weather conditions and high tides of July, 1978. Habitat loss is a second major problem for least terns in New Jersey. The number of available nest sites has declined at an annual rate of 10 percent. Many presently active sites are threatened either by development or by the intrusion of vegetative growth.

The least tern appears to be opportunistic in nest site selection and will colonize a suitable sand area though the site may be acceptable for only one year. Such sites, ephemeral due to their colonization by plants or to their development potential, rarely support major colonies. Of the total population, 34 percent of the colonies used man-made sites.

The major successful colonies of least terms are located on traditional barrier beach-dune sites. This type of habitat is critical to their maintenance as a nesting species in New Jersey. Beach front real estate, however, is extremely valuable for recreational and developmental uses. Programs to control plant growth, the second major cause of nest site loss, are being recommended by the State for several nesting areas. Filled sites and dredged material disposal sites would provide suitable nesting habitat if they were periodically covered with sand or sand and shell rubble.

2.5.8.2 BLACK SKIMMER

A similar survey of black skimmers revealed their presence in 19 locations within the State of New Jersey. Of the 19 locations, two are within the study area. The shortage of unoccupied beach sites, however, has caused the skimmer to nest on disposal sites and marsh wrack. The suitability of using disposal areas as nesting sites is often short-lived due to the emergence of vegetation and consequent loss of open sandy areas.

Skimmers, like least terns, prefer to nest on barrier island beaches but are under severe pressure in these areas because of human recreational activity, development, flooding, and predation by rodents.

A total of 2,085 adult birds was recorded for 20 locations in early June, 1978. Repeated high tides adversely affected nesting success; only an estimated 87 young were successfully fledged.

Table 2-6 FEDERALLY DESIGNATED THREATENED OR ENDANGERED ANIMALS

The following animals have been designated by the Federal government as threatened or endangered and occur, or may occur, in the study area. (See the discussion of the Endangered Species Act, Institutional Framework, Chapter 5):

	NAME	STATUS
BIRDS:	Bald Eagle *(Haliaeetus leucocephalus)*	Endangered (see State chart)
	Peregrine Falcon *(Falco peregrinus)*	Endangered (see State chart)
SEA TURTLES:	Green Turtle *(Chelonia mydas)*	Threatened oceanic summer visitor, coastal waters
	Hawksbill turtle *(Eretmochelys imbrichea)*	Endangered oceanic summer visitor, coastal waters
	Leatherback turtle *(Dermochelys coriacea)*	Endangered oceanic summer resident, coastal waters
	Loggerhead turtle *(Caretta caretta)*	Threatened oceanic summer resident, coastal waters; rarely nest in Cape May & Atlantic counties
	Atlantic Ridley Turtle *(Lepidochelys kempii)*	Endangered oceanic summer resident, coastal waters
MARINE MAMMALS:	Blue Whale *(Balaenoptera musculus)*	All whales are endangered. Whales may occur within the nearshore waters of the study area.
	Finback Whale *(Balaenoptera physalus)*	
	Humpback Whale *(Megaptera novaeangliae)*	
	Right Whale *(Eubalaena spp.)*	
	Sei Whale *(Balaenoptera borealis)*	
	Sperm Whale *(Physeter catodon)*	
FISH	Short-nosed Sturgeon *(Acipenser brevirostrum)*	Endangered resident of coastal rivers and streams

Table 2-7

STATE OF NEW JERSEY DESIGNATED THREATENED OR ENDANGERED SPECIES OF BIRDS

The following birds occur or may occur in the study area:

	NAME	STATUS
1.	Marsh Hawk *(Circus hudsonius)*	Threatened Appear as winter residents. According to the Division of Fish, Game and Wildlife, there are no known nesting pairs in the study area.
2.	Osprey *(Pandion haliaetus)*	Endangered Two nesting pairs are located in the study area.
3.	Peregrine Falcon *(Falco peregrinus)*	Endangered No nesting pairs are located in the study area though there is one nesting pair in Brigantine National Wildlife Refuge. Within the study area, they are known as migrants primarily.
4.	Bald Eagle *(Haliaeetus leucocephalus)*	Endangered Are known to winter in Brigantine National Wildlife Refuge and to pass through the study area as migrants;
5.	Cooper's Hawk *(Accipiter cooperi)*	Endangered May occur in wetland areas during migration but is typically a forest species.
6.	Short-eared owl *(Asio flammeus)*	Threatened May be a winter resident of the study area.
7.	Pied-bill Grebe *(Podilymbus podiceps)*	Threatened Has and may be expected to occur on wetlands as a summer or winter resident.
8.	Great Blue Heron *(Ardea herodias)*	Threatened Has and may be expected to occur on wetlands as a summer or winter resident.
9.	Merlin, (ex-Pigeon Hawk) *(Falco columbarius)*	Threatened May pass through the study area as a migrant.
10.	Least tern *(Sterna albifrons)*	Endangered See Section 2.5.8.1
11.	Black Skimmer *(Rhynchops nigra)*	Endangered See Section 2.5.8.2

Source: Joan Galk, Non-Game Zoologist, Division of Fish, Game & Wildlife, NJDEP

Chapter 3
LAND AND WATER USE PROFILE

3.1 PURPOSE

Patterns of land and water use have a direct impact on the type, amount, and location of activities affecting wetlands. The Land and Water Use Profile identifies and discusses the various land and water use patterns of the study area and their relationship to areas under Corps jurisdiction.

3.2 FACTORS INFLUENCING PATTERNS OF LAND AND WATER USE

Patterns of land and water use within the study area are broadly influenced by the interaction of environmental, economic and institutional factors. Patterns of land and water use were previously dominated by constraints of the physical and biological environment. Economic and institutional factors have become progressively more influential, however, in determining present and future patterns of development.

Although patterns of development have favored locations at the land-water interface, the unique and dynamic character of the coastal zone has rendered certain shore areas unsuitable for development. The wetlands of the back bays represent one such area which because of its size and natural characteristics has remained largely undisturbed by man.

The relatively undeveloped condition of the back bays is best understood by tracing historical trends of urbanization. Whereas Absecon Island was settled at an early date, its growth into adjacent marshes was limited. Frequent flooding, vulnerability to storms, unstable soils, biting fly problems, and many other suboptimal or unsuitable conditions restricted their use. The adverse effect which these natural features had on wetland development was reinforced by the added costs of construction. The cost of filling wetlands to prepare them for development was particularly significant.

These physical and financial constraints largely explain builders' preference to develop upland sites. Even in periods of growth when the demand for upland sites on Absecon Island outstripped supply, development did not encroach significantly upon wetlands. The preferred alternative was to develop upland sites on the mainland. The result of this process is reflected in today's landscape. Large tracts of relatively undisturbed coastal wetlands separate the urbanized portions of the barrier islands from the mainland. Clearly, the combination of economic and environmental factors had a significant effect on patterns of land and water use within the Atlantic City area.

Although economic and environmental factors served as deterrents to wetland development in the past, these historic reasons for avoiding such development are changing rapidly. The outlook for the future is not as it was. The disadvantages of the past have been offset by modern methods of building construction, shore protection, and mosquito control.

Within the Atlantic City area, several events have recently combined to generate rapid rates of growth. The most notable of these is the infusion of casino gambling into a previously established resort economy. The rapid growth of Atlantic City and its surrounding communities will include both primary (gambling and tourist-related) and secondary (residential and support services) forms of development. Much of the primary development and some of the secondary development will be linked to the aesthetic attraction and recreational base of the area's water resources. This link will greatly increase the pressure to develop certain waters and wetlands of the Atlantic City area.

In contrast to the historic conception of wetlands as "wastelands", contemporary society recognizes that wetlands are a critical element of natural coastal processes and an important part of the web of estuarine life. As a result, society has established the protection of wetlands as a public interest objective and has determined that the development of wetlands be regulated. By codifying the natural resource value of wetlands and assuming responsibility for their protection, government has assumed a principle role in constraining wetland alteration. Today, virtually all levels of government, Federal, State, and local, have some provision which affords protection to wetland areas. Such provisions may be explicitly stated or incorporated as part of a wider set of land and water use objectives (See Chapter 5.0, Institutional Framework).

3.3 WATER USE

The subject of water use has been divided into two categories. The first category reviews the supply, use, and discharge of potable water for domestic purposes. An overview of the various water supply and sewage systems which serve the Atlantic City area is provided. The second category focuses on the use and enjoyment of natural water features by Atlantic City residents and visitors.

3.3.1 WATER SUPPLY SYSTEM

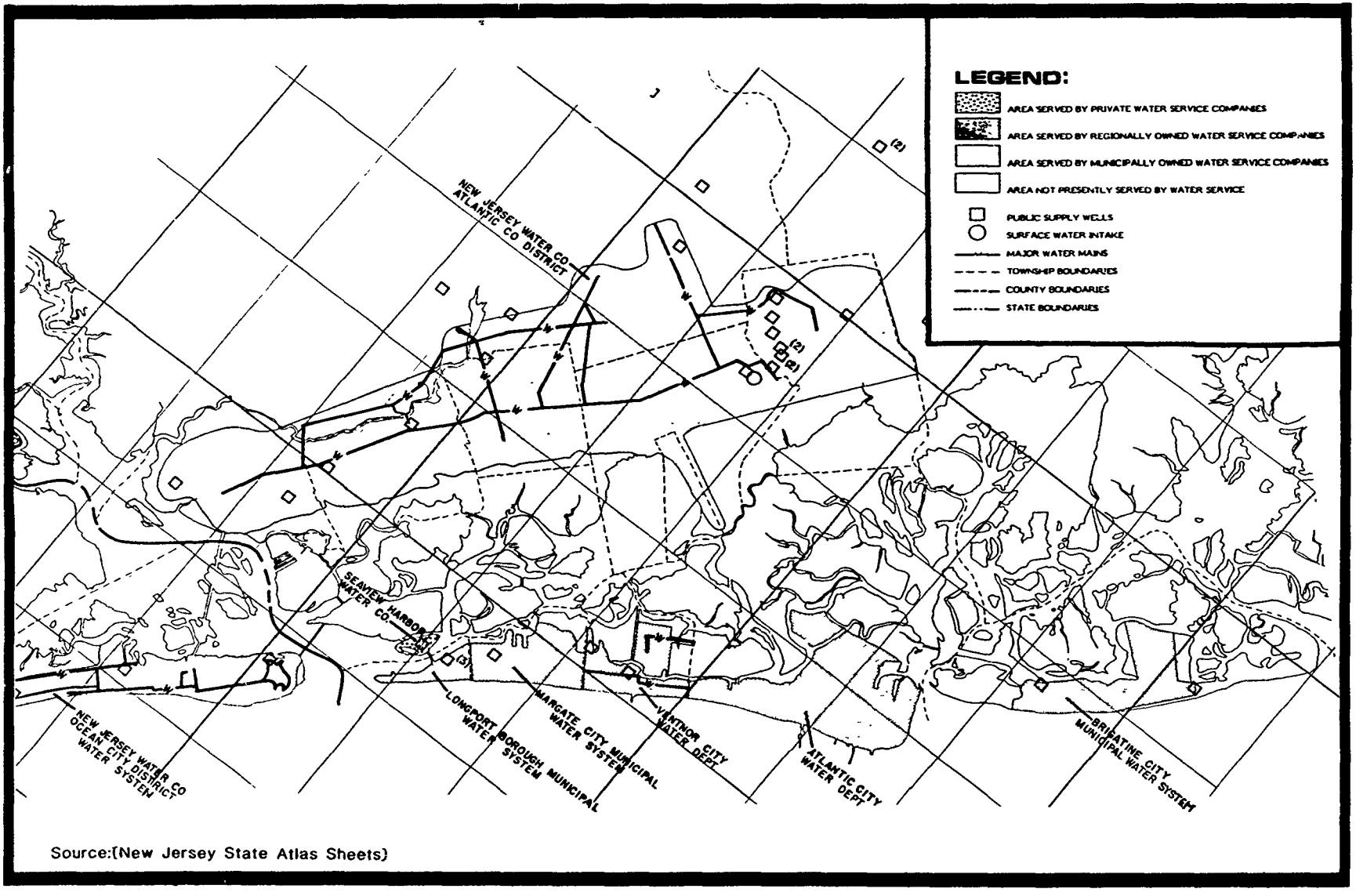
Fresh water is supplied to the Atlantic City area by a variety of subsystems. Each element of the area's decentralized water system features a different set of supply sources and service authorities. Grouped according to source, the two basic types of water supply are: surface water intake (rivers, reservoirs, etc.) and groundwater (aquifers, wells, etc.). Categorized by ownership, water service authorities fall into three groups: private, municipal, and regional. Figure 3-1 indicates the location of various elements of the water supply systems which currently serve the study area.

The location of water supply systems serving the Atlantic City study area are categorized in three broad areas:

- The barrier islands which are served by municipal water companies,
- The mainland which is served by a regional water company, and
- The back bays which are not served by any water company.

Each of the five barrier island communities maintains its own public water supply system. Longport's water system is supplied by three groundwater wells. Brigantine and Ventnor each have two public water supply wells. Margate's water supply system relies on uptake from one well site. Although the number and location of Atlantic City's water supply sites is not shown, the City is reported to have approximately twelve separate sources of ground and surface water. The inland communities which compose the mainland portion of the study area are served by a regionally operated water service company, the New Jersey Water Company, Atlantic County District. This company draws its supplies from several sources which are concentrated within the drainage basins of Patcong and Absecon Creeks. The latter is impounded by the Atlantic City Reservoir (Figure 3-2). In contrast to the island and inland portions of the study area, the back bays do not fall within the service area of any water supply company. A single exception to this situation is Seaview Harbor, a small marine/residential area where groundwater supplies are provided by a private company.

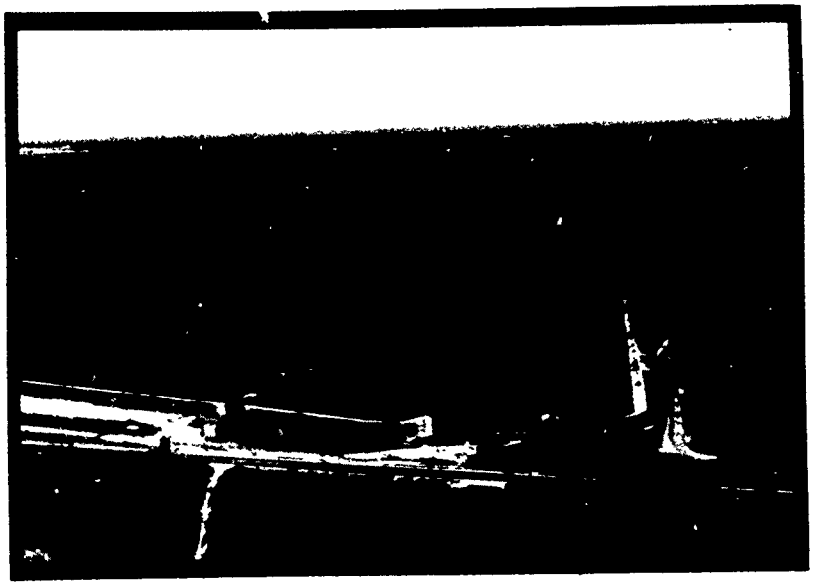
Insofar as water supplies are a fundamental requirement for development, the presence or absence of a water supply system



Source:(New Jersey State Atlas Sheets)

WATER SUPPLY SYSTEM

Figure 3-1



ATLANTIC CITY RESERVOIR **Figure 3-2**

can determine whether or not a particular locale can be developed. Except for the isolated case of Seaview Harbor, the absence of water services within the back bays has important implications with respect to back bay development.

3.3.2 SEWERAGE SYSTEM

Until recently, wastewater management within the Atlantic City study area was fragmented and generally inadequate. Municipally owned and operated facilities were responsible for the collection, treatment, and disposal of sewage and other wastes. The areas served by this decentralized sewerage system are shown in Figure 3-3. Table 3-1 identifies the administering agency, treatment process, design capacity, effluent characteristics, receiving waters, and sludge disposal methods associated with each of these facilities.

The cumulative effect of this community based wastewater management system was particularly adverse in terms of surface water quality. It directly contributed to the high coliform counts which caused the great majority of back bay waters to be condemned for shellfishing. John G. Reutter Associates (1973), reported that

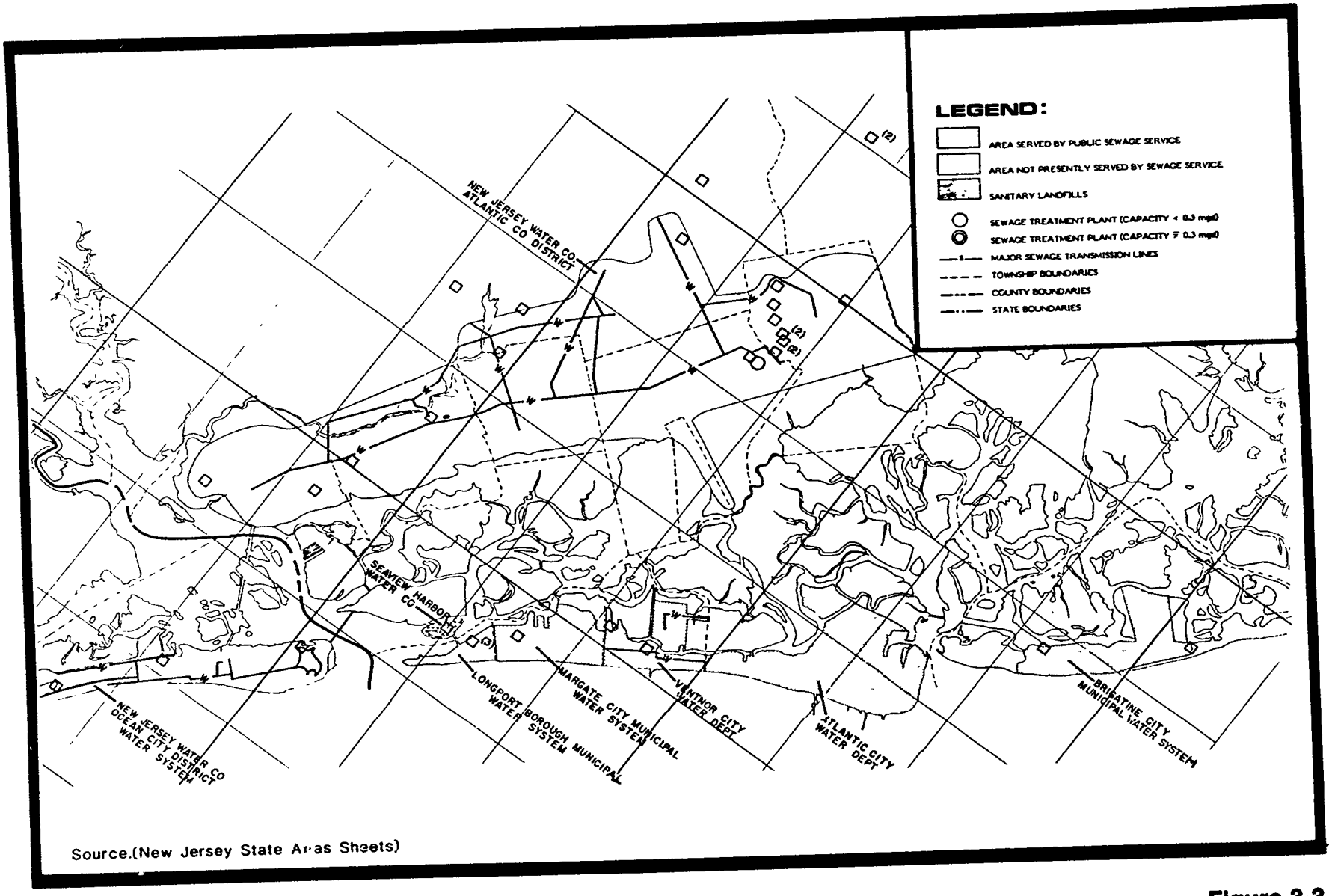
> ...water quality in the inland waterways of the Coastal Region is in such a degraded state that sewage effluent discharges into them cannot be assimilated... A principal cause of this degradation is the discharge of improperly treated municipal wastewater into the bays and estuaries.

Under the National Environmental Policy Act of 1969 and the Clean Water Act, Atlantic County began planning and feasibility studies for a regional wastewater management system. The county-wide sewerage system which evolved is divided into three service areas, each with its own sewage treatment facility:

- The Great Egg Harbor River Region,
- The Mullica River Region, and
- The Atlantic Coastal Region (Figure 3-4).

The Atlantic County Sewerage Authority was established under Chapter 14A, Title 40, of the statutes of the State of New Jersey to administer and coordinate the planning and implementation of Atlantic County's regional sewerage system. It is the authority in Atlantic County which is responsible for the acquisition, construction, maintenance, and operation of wastewater treatment facilities; and for the collection, treatment, purification, and disposal of sludge and other wastes.

The new wastewater management system presently serving the Atlantic Coastal Region consists of interceptor sewers, force mains, pumping stations, a wastewater treatment plant, and an ocean outfall diffuser system which discharges into the Atlantic Ocean. The system's wastewater treatment facilities are located at City Island in Atlantic City, previously the site of the Atlantic City Sewerage Company treatment facilities (Figure 3-5). The plant provides primary and secondary treatment of wastewater prior to discharge. It employs a complete-mixed activated sludge process which removes approximately 85% of the 5-day biochemical



Source.(New Jersey State Areas Sheets)

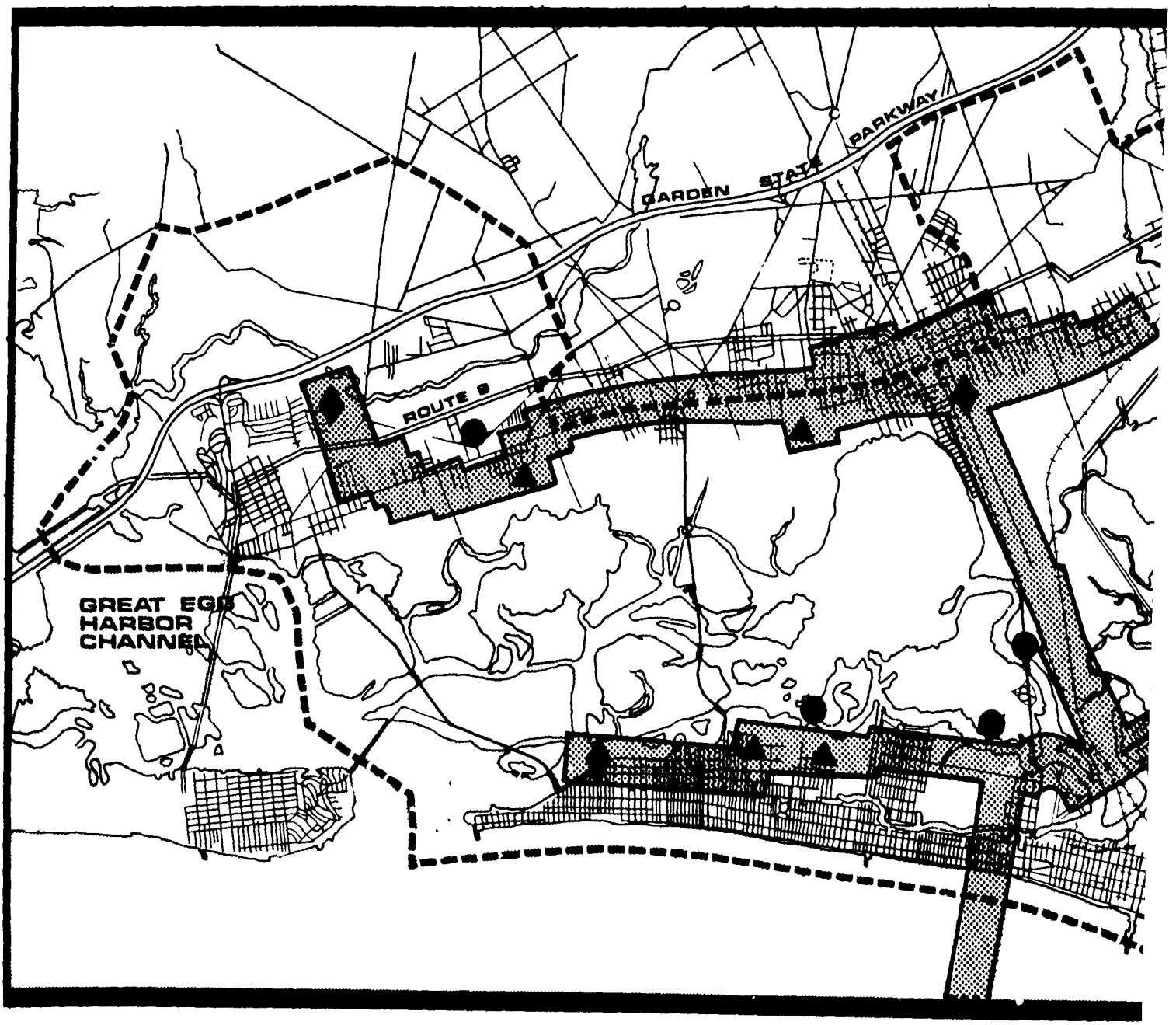
Figure 3-3

MUNICIPAL SEWERAGE SYSTEMS

Table 3-1 MUNICIPAL SEWERAGE FACILITIES, ATLANTIC CITY AREA, 1978

MUNICIPALITY:	ATLANTIC CITY	ATLANTIC CITY	BRIGANTINE	LONGPORT	PLEASANTVILLE	SOMERS POINT	VENTNOR
DISCHARGES:	Atlantic City	Atlantic City	Brigantine	Longport	Pleasantville Water Poll.	Somers Point	Ventnor-Margate Joint Treatment
RECEIVING WATERS:	Beach Thorofare	Atlantic Ocean	St. George's Thorofare	Bisley's Channel	Jonathan Thorofare	Patcong Creek	Beach Thorofare
EXISTING TREATMENT PROCESS:	Primary	Active Sludge	Contact	Primary Stabilize	High Rate	High Rate Trickling Filter	Primary
DES CAP:	18.20	40.06	0.60	0.50	2.05	1.05	3.50
FLOW (mpd) AVERAGE:	10.70	—	1.13	0.35	2.37	0.83	3.94
MAXIMUM:	13.80	—	1.52	0.39	2.80	0.93	5.29
pH MINIMUM:	6.60	—	7.00	6.19	6.70	7.50	6.30
pH MAXIMUM:	7.60	—	7.00	6.62	7.30	7.60	6.60
BOD (mg/1):	121.00	—	74.00	120.00	125.00	30.00	95.00
PERCENT:	85.00	—	67.90	50.00	92.00	87.20	36.40
CL2 RES. (mg/1):	3.75	—	12.00	2.00	5.00	5.00	1.00
FECAL COLIFORM (N/100 ML):	2400 00	—	11.50	2400.00	17.00	8.00	7.00
SLUDGE DISPOSAL:	Drying Beds (Onsite)	—	Land Application	Drying Beds (Onsite)	Fluidized Bed Incineration (Onsite)	Landfill (Egg Harbor Twp.)	Land Application Shelter Island
DATE OF LATEST MONITORING:	July, 1977	—	October, 1977	September, 1977	October, 1977	September, 1977	October, 1977

Point Source Inventory Prepared by 208 Water Quality Planning, Atlantic County, July, 1978
Sources Adapted from South Atlantic Coastal Basin Plans, August, 1976 and National Pollutant Discharge Elimination System Permits.



Atlantic City Area Wetlands Review

0 1 2MI

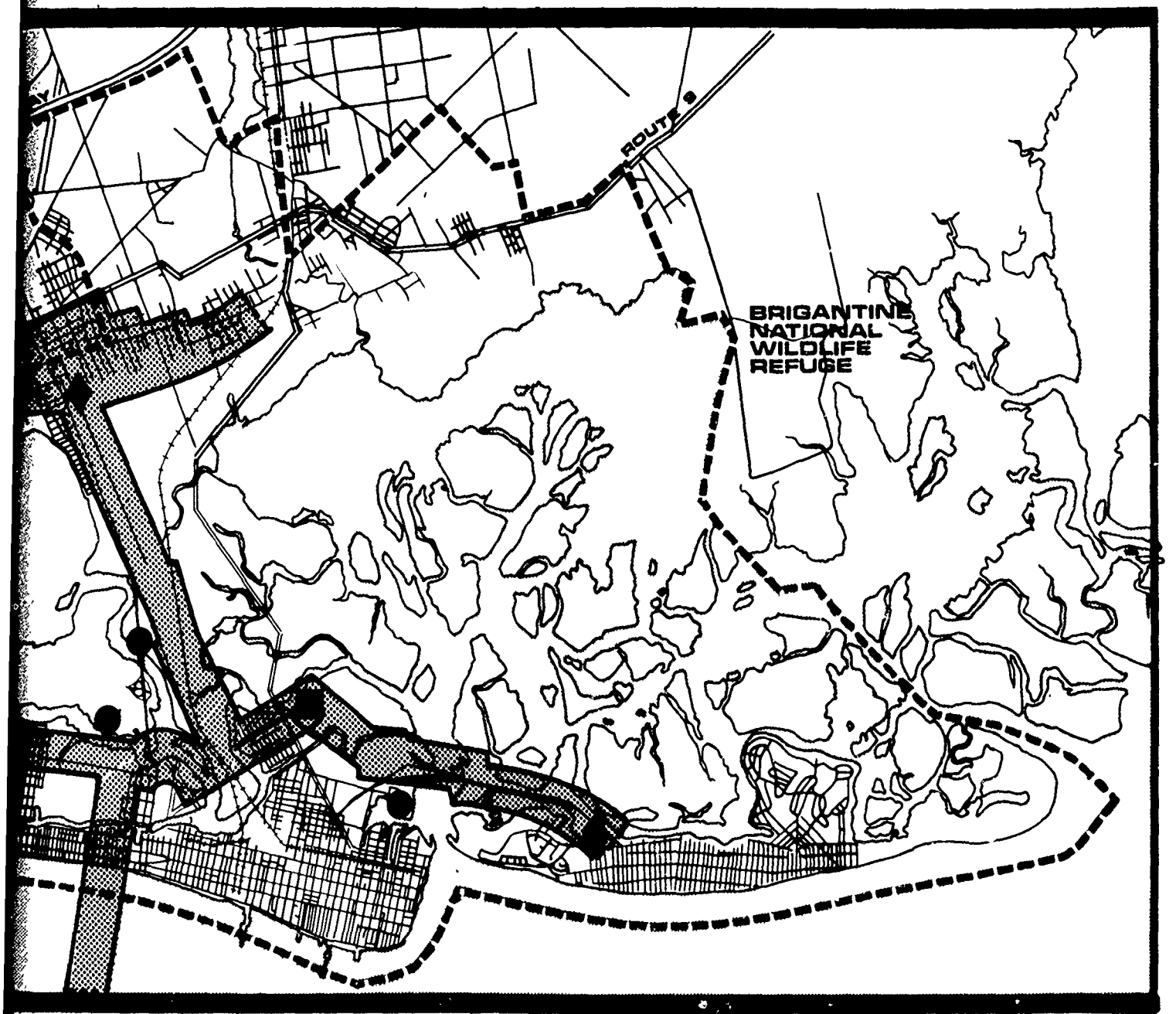
0 1 2 3 4KM

Regional Treatment Facility

Pumping Stations

Abandoned

Plant Repl
Pumping S

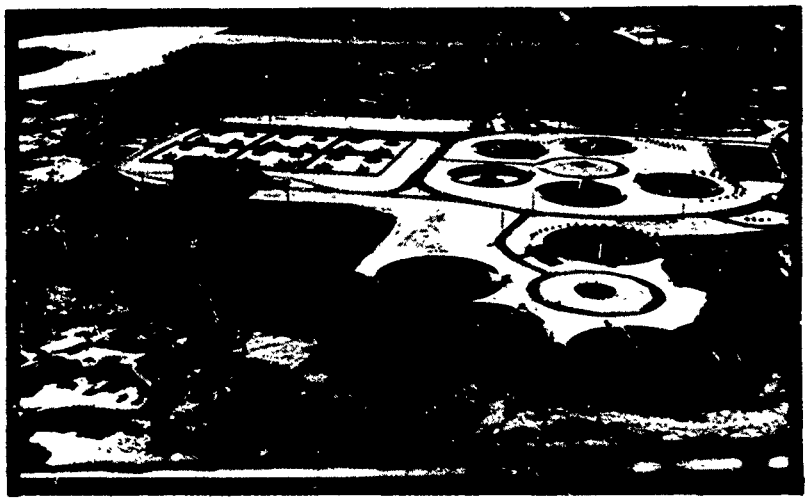


THE ATLANTIC COASTAL REGION SEWERAGE SYSTEM

● Abandoned Plant

◆ Plant Replaced By Pumping Station

Figure 3-4



REGIONAL WASTEWATER TREATMENT PLANT, ATLANTIC CITY **Figure 3-5**

oxygen demand and suspended solids content of raw wastewater. Disposal of sewage sludge is accomplished by heat treatment, centrifugation, and combustion in a multiple hearth incinerator. The plant's design capacity is 40 million gallons per day. This is considered adequate to accommodate projected sewage flows to 1985. As the plant reaches these flow limits, expansion will be necessary. All interceptor sewers, pumping stations, force mains, and the ocean outfall line have been designed to accommodate projected sewage flows for a 40 year period.

The effect of the Atlantic Coastal Region's sewerage system on patterns of land and water use within the Atlantic City area has been analyzed in the "Detailed Environmental Assessment of Atlantic County Coastal Region" (Reutter, 1973). The report found that the new regional sewerage system would generate increased rates of population growth and encourage new industrial development, especially in suburban and rural parts of inland communities. Isolating the effect of the sewerage system on patterns of development, the report observes that "where the interceptors of the sewerage system are placed to a great extent dictates where development can or will occur."

Recognizing that the presence of interceptor lines is a strong influence in favor of more intensive land use, while also noting that this same interceptor system is best placed in low-lying areas, the report goes on to explain how and why sewers were excluded from back bay wetlands:

> ...Development of the tidal marshlands requires sewerage facilities, and the ability of the collection system to feed gravity interceptors depends upon the collection sewers being higher than the interceptor system. Sewage collection and transmission could be accomplished by innumerable pumping stations, but such an approach would be very expensive and of doubtful feasibility. Therefore, the interceptor system would have to be placed in the tidal marsh to allow for gravity collection and to facilitate their development. Such, however, is not the case, and all interceptors have been routed on the mainland (except for some small, necessary marsh crossings), as it is the policy of both the State of New Jersey (Wetlands Act of 1970) and the Environmental Protection Agency to prohibit such development and to withhold funds from projects that would support this development. For the same reasons of policy, interceptor routing has not included the natural northern tip of Brigantine Island. It is felt for environmental reasons, that both the tidal marsh and the remaining natural barrier beach are valuable lands that should not be developed, and the system therefore concurs with both State and Federal policy and sound environmental planning.

Perhaps the most significant impacts of the new regional sewerage system are the benefits associated with improving the water quality of the back bays. Cleaner bay waters will provide an improved resource base for fishing, clamming, boating, birdwatching, swimming, water skiing, and other water dependent recreational activities.

3.3.3 WATER DEPENDENT ACTIVITIES

Activities which depend on the use and enjoyment of water resources are especially important to Atlantic City and its surround-

ing communities. Of the water dependent activities within the Atlantic City study area, most are recreational. Skin and scuba diving, sport fishing, swimming, clamming, hunting, canoeing, and pleasure boating by power or sail are examples. In regard to boating alone, recreation participation rates reported by the New Jersey State Comprehensive Outdoor Recreation Plan (1977) indicate that 1.2 million motor boating trips occur in Atlantic County annually.

The distribution of water uses within the study area is related to the resource needs of each activity. Swimming is most enjoyed along the oceanfront. Popular sites for underwater diving are characterized by shallow to moderately deep waters with good visibility, weak currents, and relative isolation from other forms of activity. Angling and other forms of finfishing tend to occur in relatively deep pierside or offshore waters. Shellfishing is conducted in the calm, shallow, nutrient-rich waters of the back bays. Motorboating, one of the more flexible water-based activities, most often occurs in the waterways surrounding Absecon and Brigantine Islands. Within the back bays, only boats with a draft of three feet or less are able to navigate the bays' shallow waters. At locations with water depths less than three feet at mean low water, small boat passage is often controlled by the height of tide. Figure 3-6 indicates the depth of study area waters at mean low water.

Rates of recreational water use within the study area have increased in recent years. The advent of casino gambling in Atlantic City will continue to accentuate this trend. To the extent that Atlantic City's resort-based economy depends on the area's water resources as a principal source of recreational activity, the maintenance of a quality marine environment is a critical issue from both an environmental and economic point of view.

3.4 LAND USE

Major land uses within the study area are divided into five categories:

- Open,
- Residential,
- Commercial,
- Industrial, and
- Institutional[1]

The first category refers to undeveloped or vacant lands. The latter four categories correspond to developed areas. As a percentage share of the total study area, open lands account for the largest portion, followed by residential, institutional, commercial, and industrial uses.

3.4.1 OPEN LANDS

The majority of open lands within the study area is found within the back bays. Except for the four transportation corridors connecting the barrier islands to the mainland, the back bays remain largely undeveloped. This is attributable in major part to historic patterns of urbanization which favored areas which were more easily developed. More recently, Federal and State regulatory programs have afforded wetlands a significant measure of protection.

Limited amounts of open land remain on the barrier islands, notably, the recreational preserve on the northern end of Brigantine Island. On the mainland, major areas of open space are located within the drainage basins of Patcong and Absecon Creeks. Other vacant parcels are found at scattered locations throughout the study area.

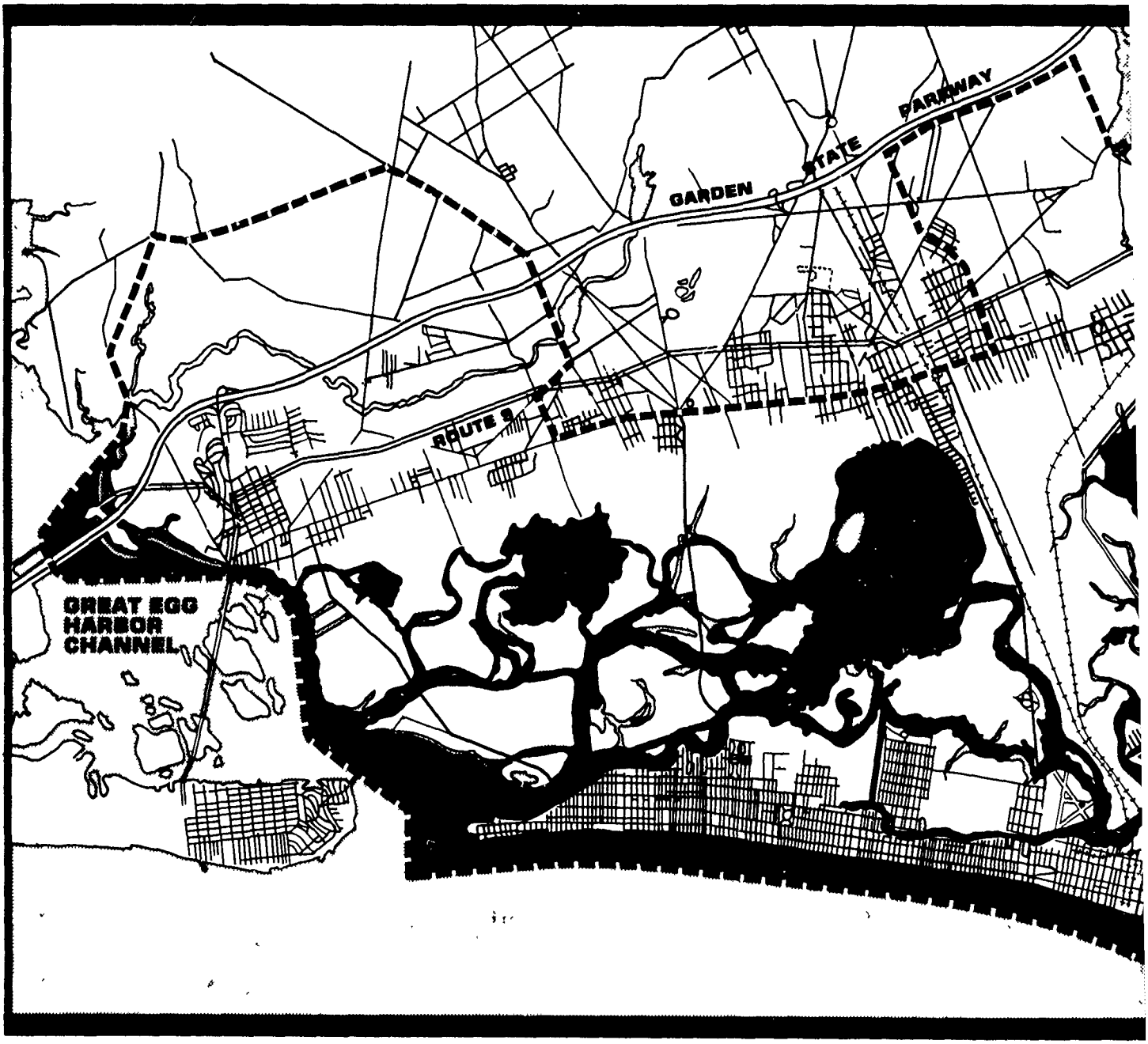
3.4.2 RESIDENTIAL

Within the study area, there are two concentrations of residential land use. The principal concentration of residential use occurs in the barrier island communities of Brigantine, Atlantic City, Ventnor, Margate, and Longport. Other concentrations of residential land use

---

[1] Institutional land use refers to areas improved for the purpose of providing some form of public service. Institutional land uses may be separated into:

- Facilities such as schools, sewage treatment plants, waste disposal facilities, public parking areas, municipal buildings, and other public works structures; and
- Infrastructure such as water supply systems, storm and sewer systems, other pipelines, utility transmission lines, roadways, and associated rights-of-way.



Atlantic City Area Wetlands Review

0 1 2MI

0 1 2 3 4KM

Depth in Feet At Mean Low Water

≤1'

1'-3'

STUDY AREA
WATER DEPTHS

ater ≤1' 3'-6'
1'-3' > 6'

Figure 3-6

are located in the inland towns of Somers Point, Linwood, Northfield, Pleasantville, and Absecon. Together, these ten communities account for close to two-thirds of the entire population of Atlantic County.In Atlantic City and Pleasantville where space is at a premium and there is a greater concentration of lower income families, multi-family dwellings are more common.

In terms of acreage, residential uses constitute the major form of development within the study area. This relatively large amount of land devoted to residential uses is largely attributable to the space requirements of detached, single family dwellings, the dominant form of housing. Low density residential development is generally found in suburban and rural communities.

Patterns of residential land use within the study area are in a state of flux due to changes brought about by casino gambling. Perhaps the most perceptible shift is in the distribution of low income housing. As casino hotels and ancillary commercial establishments vie for prime locations within Atlantic City, skyrocketing real estate values are forcing many families to relocate.

3.4.3 COMMERCIAL

Commercial land uses may be divided into several categories including retail commercial, resort commercial, light commercial, heavy commercial, highway (strip) commercial, central business districts, and enclosed shopping malls. These and other forms of commercial development are found at various locations throughout the study area. In this period of rapid economic growth, not only are existing commercial uses being intensified, new uses are being established. This situation is best represented by the complex of casino-hotels, shopping, and entertainment facilities proposed in the marina area of Atlantic City. Other forms of commercial land use expected to undergo rapid development in the near future include roadfront establishments, mall complexes, and marinas.

The largest concentration of commercial land use within the study area is located along the boardwalk in Atlantic City. Long the focus of tourist activity, the boardwalk area is presently experiencing major changes as casino gambling provides an expanded market for goods and services. Smaller clusters of commercial land use are found at the centers of other study area communities. These areas are also undergoing transition as businesses respond to increasing retail sales and service revenues.

3.4.4 INDUSTRIAL

Of the five major land use types, industrial uses account for the least total acreage. This reflects the relatively minor role which industry assumes in a resort based economy. In addition to the study area's few industrial facilities, there are two industrial parks, one in Atlantic City and one in Pleasantville.

3.4.5 INSTITUTIONAL

Institutional uses include areas which have been improved for the public good. Among the most common uses are roads, public parking areas, sewage treatment plants, utility lines, waste disposal sites, water supply systems, storm and sanitary sewer systems, and other public works projects. Roads and their associated rights-of-way are perhaps the most land consumptive institutional use, generally accounting for upwards of 35% of an urbanized area.

In an area of rapid growth, the ability of public infrastructure and facilities to accommodate the increasing service demands of a burgeoning population may impose an important constraint on the rates and patterns of development. Common growth problems associated with a lack of adequate public services include overcrowded schools, sewage overloads, sanitation violations, overdrawn water supplies, traffic congestion, deficient police and fire protection, or combinations of these and other problems. By providing or restricting certain types of institutional land uses, the local planning process has an opportunity to guide development at a pace and in a direction which best serves the public interest.

Chapter 4
PUBLIC OPINION SURVEY

4.1 PURPOSE

The Atlantic City Area Wetlands Review Community Survey was conducted to solicit the public's views on the alteration and protection of wetlands within the study area. Inasmuch as the results of the survey reflect public opinion, they represent the public interest of study area residents.

The survey sought to identify the concerns and interests of the local populace with regard to:

- The establishment of guidelines for the issuance, conditioning, or denial of permits for the alteration of wetlands;
- The general development of the study area;
- The components of an acceptable public participation program; and,
- Other issues relating to the study area's wetlands.

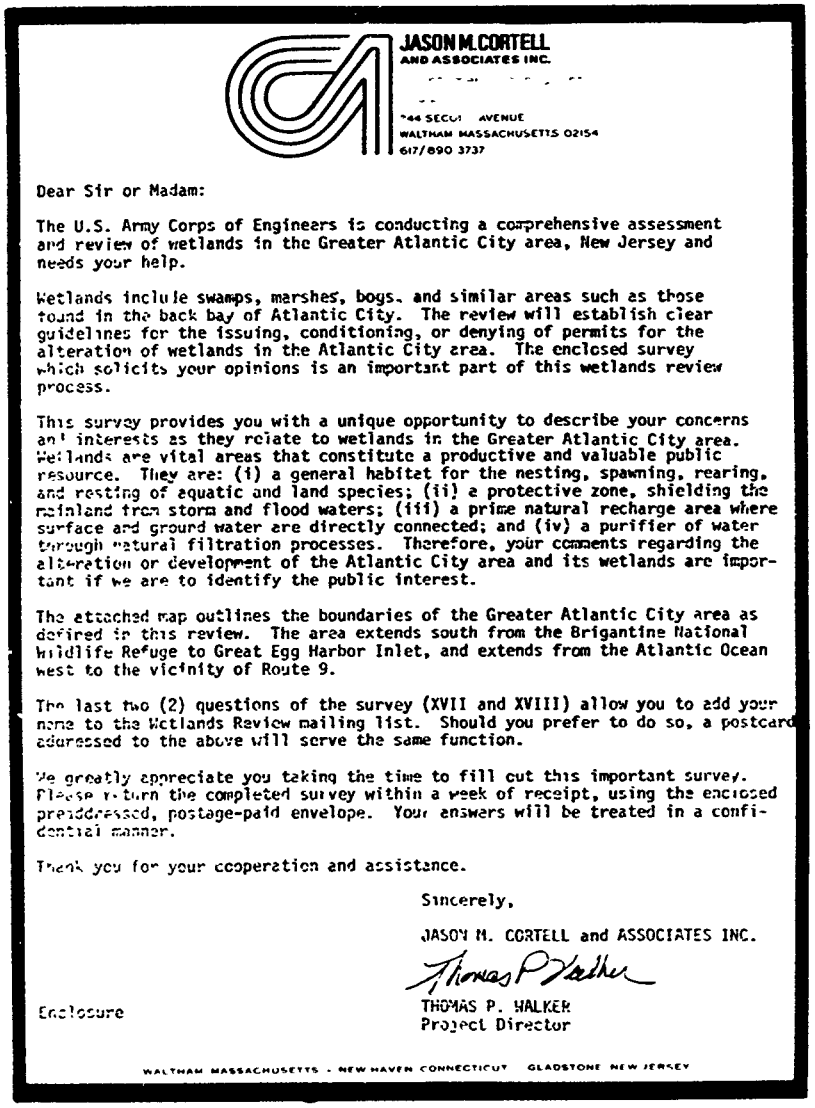
A copy of the letter accompanying the survey is presented in Figure 4-1. The survey and its results are presented in their entirety in Table 4-5.

4.2 SURVEY DESCRIPTION AND CHARACTERISTICS OF THE SURVEY POPULATION

Randomly selected households in the study area were mailed a copy of the Atlantic City Area Wetlands Review Community Survey questionnaire in the fall of 1978. Of the 7,537 surveys distributed, 1,438 were completed and returned.[1] This represents an exceptionally high response rate of 19.1% for the study area. The normal response rate, 10%, was expected.

The response rate ranged from a high of 28.1 % from residents of Northfield to a low of 8.0 % from residents of Pleasantville. The

[1] In addition to the 1,438 surveys which were completed and returned, 500 surveys were returned as undeliverable and 57 were returned but not completed.



JASON M. CORTELL
AND ASSOCIATES INC.

[illegible] AVENUE
WALTHAM MASSACHUSETTS 02154
617/890 3737

Dear Sir or Madam:

The U.S. Army Corps of Engineers is conducting a comprehensive assessment and review of wetlands in the Greater Atlantic City area, New Jersey and needs your help.

Wetlands include swamps, marshes, bogs, and similar areas such as those found in the back bay of Atlantic City. The review will establish clear guidelines for the issuing, conditioning, or denying of permits for the alteration of wetlands in the Atlantic City area. The enclosed survey which solicits your opinions is an important part of this wetlands review process.

This survey provides you with a unique opportunity to describe your concerns and interests as they relate to wetlands in the Greater Atlantic City area. Wetlands are vital areas that constitute a productive and valuable public resource. They are: (i) a general habitat for the nesting, spawning, rearing, and resting of aquatic and land species; (ii) a protective zone, shielding the mainland from storm and flood waters; (iii) a prime natural recharge area where surface and ground water are directly connected; and (iv) a purifier of water through natural filtration processes. Therefore, your comments regarding the alteration or development of the Atlantic City area and its wetlands are important if we are to identify the public interest.

The attached map outlines the boundaries of the Greater Atlantic City area as defined in this review. The area extends south from the Brigantine National Wildlife Refuge to Great Egg Harbor Inlet, and extends from the Atlantic Ocean west to the vicinity of Route 9.

The last two (2) questions of the survey (XVII and XVIII) allow you to add your name to the Wetlands Review mailing list. Should you prefer to do so, a postcard addressed to the above will serve the same function.

We greatly appreciate you taking the time to fill out this important survey. Please return the completed survey within a week of receipt, using the enclosed preaddressed, postage-paid envelope. Your answers will be treated in a confidential manner.

Thank you for your cooperation and assistance.

Sincerely,

JASON M. CORTELL and ASSOCIATES INC.

THOMAS P. WALKER
Project Director

Enclosure

WALTHAM MASSACHUSETTS · NEW HAVEN CONNECTICUT GLADSTONE NEW JERSEY

LETTER ACCOMPANYING THE PUBLIC OPINION SURVEY **Figure 4-1**

distribution of surveys and the response rates by communities comprising the study area are shown in Table 4-1.

The majority, 51%, of the respondents to the survey were from the barrier island cities — Atlantic City, Margate, Ventnor, Brigantine, and Longport (See Table 4-5, Question I). Most of the respondents were full-time residents (91%), homeowners (84%), and had lived in the study area at least 11 years (70%). Of the seasonal residents[1] who responded to the survey, approximately 60% were in the area at least once a week. Of all respondents, 68% were 45 years of age or older, 93% had completed high school and 47%, college. The largest percentages of respondents were retired, employed by business and professional services or in the public sector. Most people (79%) felt their economic needs were being adequately met. A comparison of the demographic characteristics of the respondents to the total population of the study area reveals that the sample is skewed to full-time residents, homeowners, a population 45 years and older, and persons with at least a high school education. See Table 4-5, Questions I - VII.

Only 22% of the respondents owned or managed property on or adjacent to a waterway, bay, or wetland area within the study area. Of those who owned property, 66% used it for permanent residence and 13% for seasonal or vacation homes. See Table 4-5, Question XII.

Of all respondents, 49% frequented a waterway, bay, or wetland area at least a few times a week. Their primary activities included fishing (23%), relaxing (16%), boating (15%), and sightseeing (10%). See Table 4-5, Question XIII.

[1] A seasonal resident is defined in this survey as a resident who lives in the study area less than five months a year.

Table 4-1

DISTRIBUTION OF SURVEYS AND RESPONSE RATES BY COMMUNITY SURVEYED

Community	Completed surveys[1] Number of Surveys Distributed	Number Returned	Response Rate: No. Completed/ No. Distributed
Absecon	424	82	19.3%
Atlantic City	2536	242	9.5%
Brigantine	593	131	22.1%
Egg Harbor	—[2]	86	—
Galloway	31[2]	36	—
Linwood	342	94	27.5%
Longport	171	36	21.1%
Margate	782	180	23.0%
Northfield	356	100	28.1%
Pleasantville	933	75	8.0%
Somers Point	474	95	20.0%
Ventnor	895	139	15.5%
Other	—	142	—
Total	7537	1438	19.1%

[1] In addition to the 1438 completed surveys, 500 surveys were returned as "undeliverable" and 57 surveys were returned but not tabulated due to non-completion of a significant portion of the survey

[2] The total number of surveys distributed in Egg Harbor and Galloway is not known The destination of the surveys was determined by zipcode and the zipcodes of these townships overlap with the zipcodes of several other communities The 31 surveys distributed to Galloway represent a small portion of the total These surveys were distributed to a section of Galloway and Oceanville for which there is a separate zipcode

4.3 PUBLIC SENTIMENT REGARDING ACTIVITIES AFFECTING WETLANDS

The tenor of public sentiment regarding activities affecting the Atlantic City area wetlands is summarized below. Views strongly advocated included:

- The protection of all wetlands and other natural resouces. There was a moderate level of support for the controlled filling of some wetlands as part of a managed development plan;
- The protection and maintenance of wetlands for recreational purposes and their scenic value rather than their alteration to facilitate growth of economic-related activities such as the tourist industry;
- A regional approach to the development problems of the Atlantic City area;
- The concept that citizens are responsible for the protection of wetlands. It was also felt that citizens are unaware of the value of wetlands and unfamiliar with Federal regulations affecting wetlands;
- A public participation program which includes, in order of importance, public hearings, surveys of public sentiments, and citizens serving on decision-making boards; and
- Two-thirds of the survey respondents strongly or generally agreed that the cumulative, long term effect of small fills is very serious.

The respondents to this survey represent three major schools of thought. The largest school advocates the preservation of all wetlands (67% of the respondents). The school of thought diametrically opposed, comprising 10% of the respondents, advocates the unrestricted filling of wetlands to allow development. The final group of respondents, overlapping somewhat with the above groups, advocates controlled filling of wetlands as part of a managed development plan (42% of the respondents).

Table 4-2 summarizes the responses to survey questions regarding activities potentially affecting the wetlands of the greater Atlantic City area. The survey sought to define which activities or uses, if any, justify the filling of wetlands. Potential activities proposed include:

- the expansion of existing roads;
- the expansion of activities requiring water access, such as marinas and boat ramps;
- additional development of public or private docks, parks, and other water-related facilities;
- development of activities related to the tourist industry;
- housing;
- recreational activities; and
- maintenance of the Intracoastal Waterway.

The respondents were strongly opposed to the filling of wetlands for housing (75%) or the expansion of the tourist industry (73%). Sentiment was somewhat divided regarding the permissibility of filling wetlands for the expansion of existing roads to Atlantic City (41% concurred; 45% opposed), or activites requiring water access such as marinas and boat ramps (39% concurred; 43% opposed). The population was strongly in favor of:

- Preserving the "back bay" for its scenic value (77%);
- Saving wetlands for recreational purposes (64%);
- Additional development of public docks, parks, and other water-related public activities (63%). Development of similar activities by the private sector was supported by 43% of the respondents; and
- The location of industry related to offshore oil and gas exploration in the Atlantic City area (60%).[1]

[1] Support for the location of this industry in the general area does not necessarily imply that wetlands should be filled for the activity.

Respondents also felt the Intracoastal Waterway, as it is now, is satisfactory (41% agree; 30% disagree). Only 5% indicated there should be no waterway. Other broad development policies advocated include:

- If a developer has an alternative site for a project, he/she should not fill wetlands (89%).
- The clearing and redevelopment of downtown Atlantic City is preferable to the creation of new land by filling wetlands in the back bay (86%).
- Residential and nontourist development should be concentrated on the mainland and tourist-related development along the ocean (58%).
- Shoreline development should be clustered rather than scattered along the waterway (43% agreed; 27% disagreed; and 23% need more information).

Respondents also supported nondevelopment of areas flooded by major storms and hurricanes (71%). In addition, 55% indicated that people who own wetlands should be compensated for not being able to develop their property. A regional approach to the development problems of the Atlantic City area was recommended by 78% of the respondents. Sentiment was evenly split over whether the development needs of Atlantic City should be considered separately from those of its neighbors.

Nearly all of the respondents, 92%, felt that the citizens of greater Atlantic City were responsible for the protection of the area's wetlands. It was also observed that without Federal and State protection, wetlands would disappear. The general consensus was that the populace is unaware of the value of wetlands and is unfamiliar with Federal regulations affecting them. As revealed by the responses to the survey, the public is uninformed on the number of issues affecting wetland activities. At least 15% of the respondents indicated that more information was needed before they could formulate an opinion on the following:

- Undisturbed wetlands should be saved but disturbed wetlands may be filled and developed.
- Shoreline development should be clustered rather than scattered along the waterway.
- The Intracoastal Waterway, as it is now, is satisfactory.
- There should be more private docks, marinas, and other water-related development in the study area.
- Even though filling small areas of wetlands is not particularly damaging, the cumulative, long-term effect of small fills is very severe.
- Wetlands should be filled only for activities that require water access such as marinas and boat ramps.

Most of the respondents (58%) indicated that a meaningful public participation program is possible. Twenty-six (26) percent felt the size and complexity of the area make such a program impossible. The respondents identified the three most important components of an acceptable public participation program as:

- Public hearings,
- Surveys of public sentiments, and
- Citizens on decision-making boards.

These, as well as other components of a public participation program, are ranked in Table 4-5, Question X.

In terms of actual participation, 9% of the respondents were active in any public body, interest group, or organization concerned with the use of wetlands in the study area. Seventy-four percent (74%) of the respondents had never tried to influence decisions affecting wetland use. Of those who had tried, 39% felt they had been at least relatively successful in influencing wetland use decisions.

The respondents evaluated the responsiveness to the public interest of Federal, State, County, and city governments responsible for the management of wetlands (see Table 4-5, Question XI). Federal agencies were seen as the most responsive, particularly the:

U.S. Fish and Wildlife Service (U.S. Department of the Interior),

U.S. Environmental Protection Agency,

Table 4-2 ATTITUDES TOWARD ACTIVITIES AFFECTING WETLANDS[1]

VIII. Please indicate how you feel about the following statements. All statements relate to the study area.

		Strongly or Generally Agree	Strongly or Generally Disagree
a.	There should be unrestricted filling of the back bay wetlands to allow development of the Atlantic City area	9.9%	82.8%
b.	All wetlands of the back bays should be preserved	66.5%	23.4%
c.	The filling of some wetlands of the back bays should be allowed as part of a managed development plan for the Atlantic City area.	41.6%	45.0%
d	Existing roads to Atlantic City should be expanded even if it means filling wetlands	41.0%	44.5%
e.	Expansion of the tourist industry in Atlantic City justifies the filling of wetlands in the back bays.	18.2%	73.1%
f.	The need for housing in Atlantic City is great enough to require the filling of wetlands in the back bays.	15 1%	75.2%
g.	Wetlands should be saved for recreational purposes.	63.5%	20.2%
h	The additional development of public docks, parks, and other water-related public facilities is needed.	62.5%	20.2%
i.	Wetlands should be filled only for activities that require water access, such as marinas and boat ramps.	38.5%	42.6%
j.	If a developer has an alternative site for his project, he should not fill wetlands	89.2%	7.1%
k	The location of industry related to the offshore oil and gas exploration should be encouraged in the Atlantic City area.	60 2%	29.3%
l.	The clearing and redevelopment of downtown Atlantic City is preferable to the creation of new land by the filling of wetlands in the back bays.	86.3%	9.3%
m.	The Intracoastal Waterway, as it now is, is satisfactory.	41.3%	30.0%
n.	There should be no Intracoastal Waterway.	5.0%	78.7%
o	There should be more private docks, mannas, and other water-related development in the study area.	43.1%	31.9%

		Strongly or Generally Agree	Strongly or Generally Disagree
p.	Residential and nontourist development should be concentrated on the mainland, and tourist-related development should be located along the ocean.	54.8%	29.9%
q.	Citizens are not familiar with federal regulations concerning wetlands.	89.3%	4.2%
r.	Generally, people are not aware of the value of wetlands.	92.2%	4.0%
s.	The citizens of the Atlantic City area have a responsibility to protect their wetlands.	91.8%	4.2%
t.	Without Federal and State protection, wetlands would eventually disappear.	90.0%	5.1%
u.	Shoreline development should be "clustered" rather than scattered along the waterway.	42.6%	26.6%
v.	The back bays should be preserved for their scenic value.	77.0%	13.6%
w	There should be a regional approach to the development problems of the Atlantic City area.	77.7%	6.5%
x	The development needs of Atlantic City should be considered separately from those of its neighbors.	46.5%	47.0%
y.	The size and complexity of the Atlantic City area make having a meaningful public participation program almost impossible.	26.0%	58.1%
z.	People who own wetlands should be compensated for not being able to develop this property.	55.4%	27.7%
aa.	Areas that are flooded by major storms and hurricanes should not be developed.	70.8%	15.9%
bb.	Undisturbed wetlands should be saved, but disturbed wetlands may be filled and developed	30 2%	42.6%
cc.	Even though filling small areas of wetlands is not particularly damaging, the cumulative, long-term effect of small fills is very serious.	67.0%	13.7%
dd.	The public needs to know the U.S. Army Corps of Engineers' attitude toward development of wetlands of the study area.	94.0%	2.0%

[1]The percentages do not sum to 100% as the respondents indicating "need more information" or "no opinion" are not included.

U.S. Army Corps of Engineers[1], and

National Marine Fisheries Service (U.S. Department of Commerce).

The New Jersey Office of Wetlands Management was cited as the most responsive State agency. The city and County governments were found to be unresponsive by the greatest percentage of respondents (37% and 26%, respectively). As shown in Table 4-5, Question XI, a large percentage had no opinion as to the responsiveness of various governmental organizations, especially State organizations.

4.4 STANDARDS FOR PERMIT APPLICATION REVIEW

The respondents' assessment of the importance of various considerations in setting standards for permit issuance is presented in Table 4-5, Question IX. In reviewing permit applications, the respondents strongly advocated the protection of natural resources. Economic concerns such as increasing the area's employment opportunities, encouraging expansion of tourist-related facilities, and increasing the area's tax base were given less favorable consideration.

The concerns the respondents found to be most important were:

- Maintaining or upgrading water quality;
- Maintaining fish, shellfish, and wildlife habitats;
- General environmental concerns;
- Preventing flood damage;
- Protecting natural wetland functions;
- Protecting places of special scenic value; and
- Maintaining or improving navigation.

Of importance, but less important than the above considerations, were:

- Maintaining the character of coastal communities,
- Increasing control over dock location,
- Meeting recreation needs,
- Increasing area employment opportunities,
- Improving access to Atlantic City, and
- Encouraging expansion of tourist-related facilities.

Increasing the area's tax base was identified as important by 41% of the population.

The respondents were also asked to identify any special or scenic places in the study area which they felt should be protected. The place cited most frequently abuts the study area — Brigantine National Wildlife Refuge. Other major areas identified include the Egg Harbor and Mullica[1] River areas, and Absecon coastal wetlands.

The respondents referred repeatedly to general designations such as all meadowlands, backwaters, bay areas, back bay waterways, and marshland. Table 4-3 lists the study area's special or scenic features as identified by survey respondents.

4.5 SUMMARY OF RESPONDENTS' WRITTEN COMMENTS

There were nearly 500 responses to the request at the end of the survey for "any additional comments which you feel should be

[1] Ninety-four percent of the respondents felt the public needs to know more about the attitude of the Corps towards the development of wetlands

[1] The Mullica River is located outside the study area.

Table 4-3

SPECIAL OR SCENIC FEATURES OF THE STUDY AREA

Places Identified by 15 or more Respondents	
Brigantine National Wildlife Refuge	140[1]
Egg Harbor River Area	37
Mullica River Area	20[2]
Absecon Coastal Wetlands	18
All meadowlands, backwaters, bay areas, backbay waterways, marshland	56

Places Identified by 5 to 15 Respondents	
Intracoastal Waterway	13
Lakes Bay	11
Scull Bay	8
Great Bay	8[2]
Birch Grove Park	8
Absecon Inlet	7
Patcong Creek	6
Longport-Somers Point Boulevard	6
Pine Barrens	5[2]
Absecon Island	5

Places Identified by less than 5 Respondents	
Absecon Lagoon	4
Gardners Basin	4
Kennedy Park-Somers Point	4
Rum Point Area	2
Reeds Bay	1
Beach Haven Inlet	1[2]
Bargaintown Pond	1[2]
Somers Point Bay	1
Margate Bridge Causeway	1
White Horse Pike	1
Black Horse Pike	1

[1]The number to the right of each place indicates the number of times it was identified by survey respondents.
[2]These places were identified by the survey respondents but are not located in the study area.

taken into account in the wetland review of the study area." Over 300 of these were primarily concerned with three major issues:

- the preservation of wetlands,
- controlled development of some wetlands, and
- development of all wetlands.

Approximately 210 comments advocated the preservation of all wetlands. The respondents ranged from an 8 year old boy who wrote, "I believe you should let the animals live for if you build houses they will die ...," to a 75 year old man who recalled "walking the wetlands...there used to be pheasants...but they are all gone...I love the meadows. Don't let them destroy it. I walked the meadows...and saw that destroyed." The common theme of these comments was succinctly expressed by one respondent — "Leave them (the wetlands) alone!"

Approximately 74 responses advocated the controlled development of wetlands. Representative sentiments were, "There must be a sensible balance between environmental quality and the needs of 'civilization'..." and "There must be progress. The area's industry and commerce must be developed. However, all development must be controlled in order to preserve the natural beauty and natural functions, and protect wildlife." Statements were often conditioned: "Try to leave wetlands as undisturbed as possible except..to improve access to Atlantic City which will eventually improve tourist trade," or "Fill only damaged wetlands."

There were 33 responses which advocated the development of wetlands in the hope of decreasing taxes, encouraging casino development, and meeting general economic needs. Some of the views expressed included "We have enough swamps and bogs for aquatic and other species to inhabit...Let's develop these properties so we can decrease some of our taxes." "Casino gambling is unique and special to Atlantic City and the surrounding area, therefore special and more liberal laws should apply in regard to wetlands development here."..."People come first, let the wetlands be developed to make Atlantic City grow."

There was also a series of comments highlighting the following:

- The public is generally uninformed about the value and significance of wetlands. "Sir, I am concerned with the wetlands...I would like to have more information...I'm afraid, like many, I'm not as well informed as I should be. I realize that thinking or being concerned isn't enough, action is ...;"
- The public should be better informed through established procedures. "More publicity should be given to issues and decisions..." "A committee of concerned citizens should have authority..." "Additional emphasis with educational programs in schools...;"
- "Speakers should be sent to civic groups, PTA's, women's clubs and organizations, schools, churches, etc..." "Newspapers should run a 5-or-6-part study;"
- Government responsibility for the protection of wetlands should be consolidated. "One of the prime difficulties in trying to accomplish anything in the area is the number of overlapping agencies — local-state-federal — you must deal with." "Entirely too many governmental bodies, organizations involved. Should be consolidated into one;"
- "People who own wetlands should be compensated for not being able to develop their property;"
- "The inland waterway should be maintained and improved. This is one of our greatest assets;"
- "...Stop sewerage running into the Bay...clean up the edge of the bays. Not use it for a handy dumping place;"
- Better and new access roads to Absecon Island should be constructed to help alleviate flow of traffic." "The access roads to Atlantic City should be improved — not by filling in the wetlands but by bridging them;"

Table 4-4 summarizes the major topics addressed by survey respondents.

Table 4-4 MAJOR TOPICS ADDRESSED BY SURVEY RESPONDENTS

Topic	Number of Comments
Pro-Preservation of Wetlands	210
Pro-Controlled Development of Some Wetlands	74
Pro-Development of Wetlands	33
Public Uninformed on Topic of Wetlands	18
Recommended Procedures for Informing Public	29
Government Responsibility for Protection of Wetlands	26
Compensation for Owners of Wetlands	9
Inland Waterway	13
Sewerage in Back Bays	6
Access to Study Area	12
Suggestions Regarding Specific Areas and Miscellaneous Comments	66
Total	496

Table 4-5

ATLANTIC CITY AREA WETLAND REVIEW COMMUNITY SURVEY AND RESULTS[1]

I. Where is your present permanent place of residence?

Absecon City	5.7%	Linwood City	6.5%	Somers Point City	6.6%	Delaware	0.1%
Atlantic City	16.9%	Longport Borough	2.5%	Ventnor City	9.7%	New York	0.3%
Brigantine City	9.1%	Margate City	12.5%	Elsewhere in New Jersey	2.4%	Other State	0.8%
Egg Harbor Township	6.0%	Northfield City	7.0%	Pennsylvania	6.0%		
Galloway Township	2.5%	Pleasantville City	5.2%				

II. a. Which category best describes your pattern of residence in the study area?

Full-time (5 months or more per year)	90.8%	Seasonal (less than 5 months per year)	8.3%	Visitor (non-resident)	1.0%

b. If you are a resident of the study area, do you own or rent your dwelling unit?

Own	84.1%	Rent	15.9%

c. If you are a full-time resident, how long have you lived in the area?

Less than 2 years	3.0%	2-5 years	11.3%	6-10 years	15.3%	11 or more years	70.4%

d. If you are a seasonal resident or a visitor, how often are you in the study area?

Every few years	1.0%	2 or 3 times a year	5.6%	Every week	35.2%
Every year	19.4%	Once a month	4.3%	Every day	24.5%

III. What is your age group?

15-24 years	2.4%	35-44 years	14.6%	55-64 years	23.6%
25-34 years	14.6%	45-54 years	19.9%	65 years or older	27.9%

IV. What is your sex?

Female	23.0%	Male	77.0%

V. What is the highest education level you have completed?

Grade school	6.8%	Post-high school/ vocational training	13.7%	College	31.0%
High school	32.3%			Post-graduate	16.2%

VI. What is your primary occupation?

Commercial Fisheries	0.4%	Restaurant industry	1.5%	Construction	6.3%	Oil and utility related industry	3.3%
Marine oriented (for example, boating or marinas)	1.2%	Wholesale and retail trade, tourist-related	1.4%	Doctor or lawyer	4.9%	Public employee	9.7%
Recreation oriented	1.1%	Wholesale and retail trade, non-tourist	5.6%	Other business and professional services	17.4%	Homemaker	4.5%
Motel/hotel industry	1.0%	Real estate	2.5%	Manufacturing	2.9%	Retired	23.1%
				Transportation or Communication	5.0%	Student	0.8%
						Unemployed	1.2%
						Other	6.4%

[1]The results of the survey are presented as a percent of those responsing to each question. Percentages have been rounded to the nearest tenth of a percent.

VII. How well are your economic needs being met?

Adequately 79.4% Inadequately 12.6% With great difficulty 8.0%

VIII. Please indicate how you feel about the following statements. All statements relate to the study area.

	Strongly Agree	Generally Agree	Generally Disagree	Strongly Disagree	Need More Information	No Opinion
a. There should be unrestricted filling of the back bays' wetlands to allow development of the Atlantic City area.	4.5%	5.4%	16.2%	66.6%	6.2%	1.0%
b. All wetlands of the back bays should be preserved.	43.5%	23.0%	14.5%	8.9%	9.1%	1.1%
c The filling of some wetlands of the back bays should be allowed as part of a managed development plan for the Atlantic City area.	13.1%	28.5%	14.3%	30.7%	12.3%	1.0%
d Existing roads to Atlantic City should be expanded even if it means filling wetlands.	16.8%	24.2%	17.7%	26.8%	13.3%	1.3%
e. Expansion of the tourist industry in Atlantic City justifies the filling of wetlands in the back bays.	6.6%	11.6%	23.0%	50.1%	7.8%	0.9%
f. The need for housing in Atlantic City is great enough to require the filling of wetlands in the back bays.	6.6%	8.5%	22.6%	52.7%	8.4%	1.2%
g. Wetlands should be saved for recreational purposes.	27.7%	35.8%	12.5%	7.7%	13.3%	3.0%
h. The additional development of public docks, parks, and other water-related public facilities is needed.	25.7%	36.8%	11.3%	8.9%	14.1%	3.2%
i Wetlands should be filled only for activities that require water access such as marinas and boat ramps	10.9%	27.6%	26.4%	16.2%	15.0%	3.9%
j. If a developer has an alternative site for his project, he should not fill wetlands	64.4%	24.8%	3.8%	3.3%	2.6%	1.0%
k The location of industry related to the offshore oil and gas exploration should be encouraged in the Atlantic City area.	30.6%	29.6%	11.5%	17.8%	9.4%	1.1%
l. The clearing and redevelopment of downtown Atlantic City is preferable to the creation of new land by the filling of wetlands in the back bays.	64.0%	22.3%	4.1%	5.2%	3.5%	0.9%
m. The Intracoastal Waterway, as it now is, is satisfactory	13.8%	27.5%	14.3%	15.7%	20.8%	7.9%
n. There should be no Intracoastal Waterway.	2.9%	2.1%	16.7%	62.0%	10.0%	6.3%
o. There should be more private docks, marinas, and other water-related development in the study area.	14.5%	28.6%	18.8%	13.1%	17.5%	7.5%

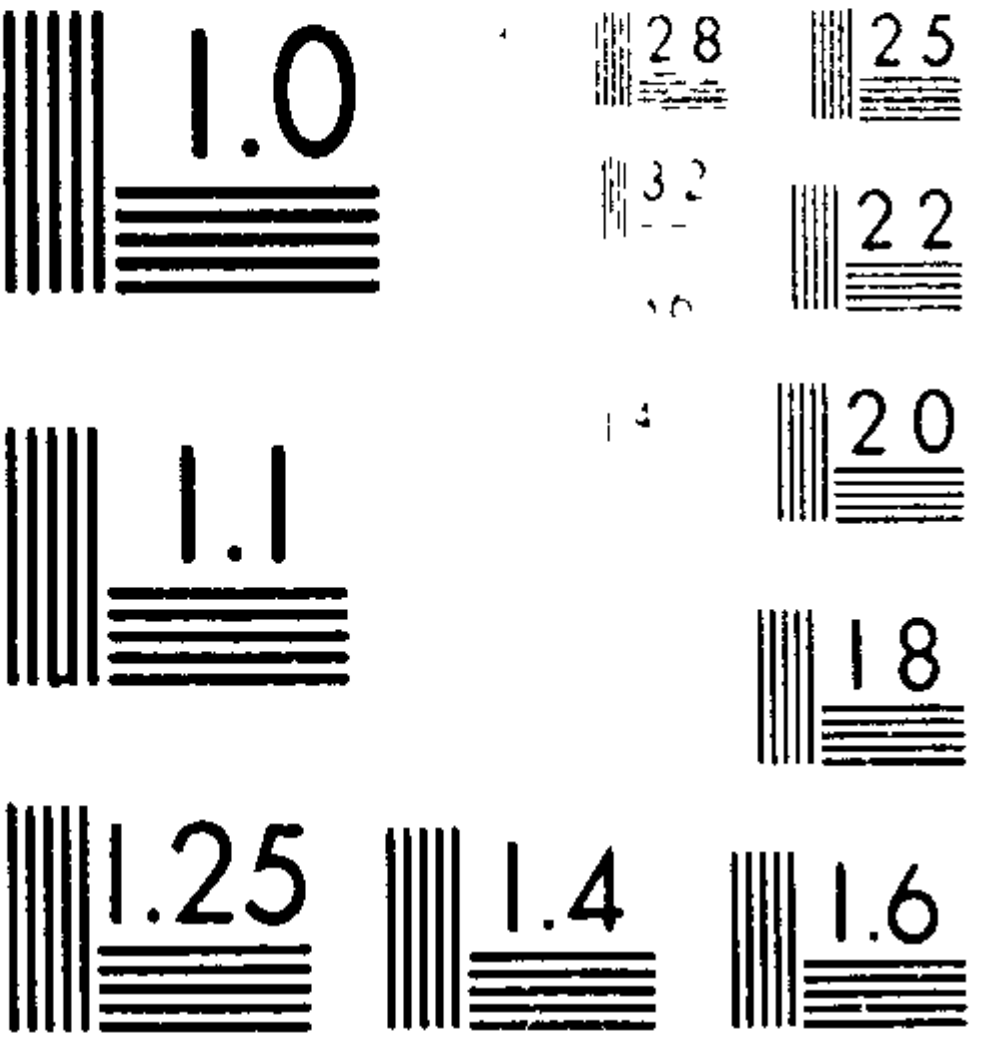
		Strongly Agree	Generally Agree	Generally Disagree	Strongly Disagree	Need More Information	No Opinion
p	Residential and nontourist development should be concentrated on the mainland, and tourist-related development should be located along the ocean.	22.1%	36.3%	16.5%	13.4%	8.9%	2.9%
q.	Citizens are not familiar with Federal regulations concerning wetlands.	50.5%	38.8%	3.1%	1.1%	4.0%	2.6%
r.	Generally, people are not aware of the value of the wetlands.	57.4%	34.8%	2.8%	1.2%	2.2%	1.6%
s.	The citizens of the Atlantic City area have a responsibility to protect their wetlands.	65.6%	26.2%	2.4%	1.8%	2.5%	1.6%
t.	Without Federal and State protection, wetlands would eventually disappear.	68.3%	21.7%	3.3%	1.8%	3.5%	1.4%
u.	Shoreline development should be "clustered" rather than scattered along the waterway.	17.8%	24.8%	16.7%	9.9%	22.5%	8.3%
v.	The back bays should be preserved for their scenic value.	41.4%	35.9%	10.1%	3.5%	5.0%	4.3%
w.	There should be a regional approach to the development problems of the Atlantic City area.	39.0%	38.7%	3.4%	3.1%	12.0%	3.8%
x.	The development needs of Atlantic City should be considered separately from those of its neighbors	22.9%	23.6%	23.6%	23.4%	5.0%	1.6%
y.	The size and complexity of the Atlantic City area make having a meaningful public participation program almost impossible.	9.4%	16.6%	31.8%	26.3%	10.6%	5.4%
z	People who own wetlands should be compensated for not being able to develop this property.	24.5%	30.9%	14.9%	12.8%	13.4%	3.6%
aa.	Areas that are flooded by major storms and hurricanes should not be developed.	43.5%	27.3%	10.0%	5.9%	11.0%	2.3%
bb.	Undisturbed wetlands should be saved, but disturbed wetlands may be filled and developed.	8.8%	21.4%	22.6%	20.0%	24.1%	3.1%
cc	Even though filling small areas of wetlands is not particularly damaging, the cumulative, long-term effect of small fills is very serious	38.1%	28.9%	9.3%	4.4%	16.2%	3.1%
dd	The public needs to know the U.S. Army Corps of Engineers' attitude toward development of wetlands of the study area.	69.7%	24.3%	1.5%	0.5%	2.9%	1.0%

IX. In setting standards for issuing permits in the study area, what do you feel the Corps of Engineers should consider to be very important, important, or of no importance?

	Very Important (%)	Important (%)	No Importance (%)	No Opinion (%)
a. General environmental concerns.	70.4	27.3	1.0	1.3
b. Protecting natural wetland functions.	69.5	27.1	2.0	1.4
c. Maintaining fish, shellfish, and wildlife habitats.	78.8	19.4	1.0	0.8
d. Maintaining or upgrading water quality.	80.2	18.7	0.6	0.6
e. Improving access to Atlantic City.	31.9	43.5	19.4	5.2
f. Increasing the area's tax base.	14.1	26.9	39.7	19.3
g. Increasing the area's employment opportunities	37.1	38.4	20.6	3.8
h Encouraging expansion of tourist-related facilities	27.5	41.9	25.1	5.6
i Meeting recreation needs.	28.2	51.8	15.1	4.9
j. Preventing flood damage.	75.5	21.7	2.2	0.6
k Protecting places of special scenic value.	57.4	37.2	4.0	1.3
l. Maintaining the character of the coastal communities.	50 2	37.0	9.1	3.7
m. Maintaining or improving navigation.	54.6	37.3	4.6	3.5
n. Increasing control over dock location.	37.2	43.5	11.2	8.1

X. What should be part of an acceptable public participation program? (Select up to three responses and put the number of the most important one in the first box, the number of the next most important in the second box, and the number of the third most important response in the last box.)

	Most Important (%)	Second Most Important (%)	Third Most Important (%)
Public Hearings	41.8	23.0	18.0
Surveys of Public Sentiments	22.2	31.3	20.7
Personal Interviews	5.3	11.4	10.7
Referenda	13.4	13.5	19.0
Citizens on Decision-Making Boards	15.6	20.2	29.2
Other	1.7	0.6	2.4


1.0
2.8
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2.2
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1.25
1.4
1.6

XI. Of the following government organizations that have some responsibility for the management of wetlands, how responsive do you think each is to the total public interest?

		Quite Responsive (%)	Somewhat Responsive (%)	Unresponsive (%)	No Opinion (%)
a.	City government	11.9	37.3	37.1	13.7
b.	County government	10.8	48.7	25.5	15.0
c.	Office of Coastal Zone Management, State of New Jersey	21.1	29.3	9.2	40.4
d.	Office of Wetlands Management, State of New Jersey	30.5	28.1	7.0	34.3
e.	Office of Riparian Lands Management, State of New Jersey	16.7	26.4	10.0	46.9
f.	Office of Stream Encroachment, State of New Jersey	13.4	22.7	9.9	53.9
g.	Office of Shore Protection, State of New Jersey	18.5	25.6	9.7	46.2
h.	Natural Resources Council, State of New Jersey	17.8	26.4	8.3	47.5
i.	U.S. Army Corps of Engineers	36.3	31.9	8.8	23.0
j.	U.S. Environmental Protection Agency	39.9	30.1	8.4	21.5
k.	U.S. Fish and Wildlife Service, Department of the Interior	42.2	28.3	6.3	23.2
l.	National Marine Fisheries Service, U.S. Department of Commerce	32.1	27.8	7.2	32.9

XII. a. Do you own or manage property on or adjacent to a waterway area within the study area?

Yes 22.0% No 78.0%

b. If yes, how is it primarily used?

Permanent residence	65.7%	Marine-oriented business (e.g. marinas, commercial fishing)	4.0%	Wholesale and retail trade, tourist	2.0%	Hotel/motel and/or restaurant	0.7%
Seasonal or vacation home	12.9%			Wholesale and retail trade, non-tourist	1.3%	Undeveloped	5.6%
Private dock	5.3%					Other	2.6%

XIII. a. How often do you frequent a waterway, bay, or wetlands area in the study area?

Almost daily	22.8%	A few times per week	25.8%	A few times per month	27.8%	Rarely	23.6%

b. What is your *primary* activity while at the waterway, bay, or wetland?

Employment	6.8%	Hiking/walking	7.5%	Sunbathing	2.0%	Fishing	23.1%
Shopping	4.0%	Birdwatching	2.6%	Swimming	6.2%	Shellfishing	1.6%
Sight-seeing	9.6%	Relaxing	15.9%	Boating	14.8%	Hunting	0.4%
				Other	5.4%		

XIV. a. Are you active in any public bodies, interest groups or organizations which are concerned with the use of wetlands in the study area?

Yes 9.0% No 91.0%

b. How successful have you, or any groups you are associated with been in influencing decisions regarding the sue of wetlands?

Successful 1.4% Relatively successful 8.9% Relatively unsuccessful 9.0% Unsuccessful 7.0%
Haven't tried 73.8%

XV. Please make any additional comments which you feel should be taken into account in the wetlands review of the study area:

XVI. Are there any special or scenic places or features in the study area that you feel should be protected? Where and what are they?

Chapter 5
INSTITUTIONAL FRAMEWORK

5.1 INTRODUCTION

This chapter provides an overview of the governmental agencies which have jurisdictional interest in the wetlands of the study area. It does not, however, undertake to specify the functional relationships among closely-related agencies. This task is addressed in Volume I, Section 1.2.2, Permit Application Review Process, a practical approach to the Corps' regulatory functions program.

5.2 FEDERAL AGENCIES

The Federal agencies most often involved in the regulation of activities affecting wetlands are shown in Figure 5-1. Three are directly involved in the Corps' application review process. They are the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the U.S. Environmental Protection Agency.

The regulatory programs of the agencies identified in Figure 5-1 are discussed below.

5.2.1 U.S. ARMY CORPS OF ENGINEERS

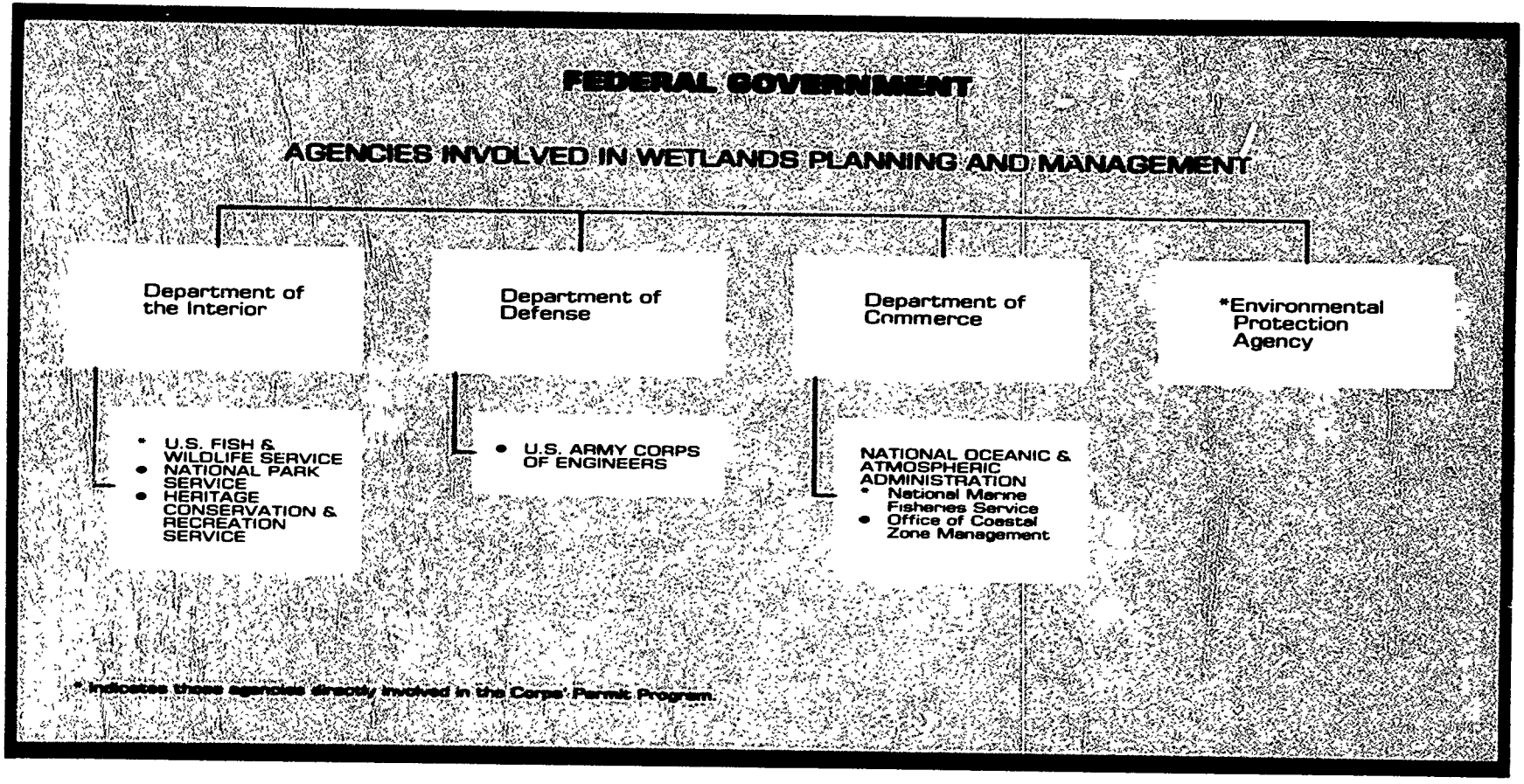
The Department of the Army acting through the Corps is responsible for administering various Federal laws that regulate certain types of activities in specific classifications of waters and wetlands of the United States.

The general policies and procedures pursuant to the Corps' regulatory functions program are set forth in its Rules and Regulations, Title 33 of the Code of Federal Regulations, Parts 320 to 329 issued July 19, 1977. The authority of the Corps to issue permits for activities in water bodies and wetlands derives from several statutory sources. Key legislative provisions authorizing the Corps' involvement in activities which alter wetlands include:

- The River and Harbor Act of 1899 (Sections 1, 9, 10, 11, 13, and 14);
- The Clear Water Act (Section 404); and
- The Marine Protection, Research and Sanctuaries Act of 1972 (Section 103).

There are six basic types of activities that require issuance of Corps permits:

- Construction of dams or dikes in navigable waters of the United States;
- All other structures or work including excavation, dredging, or disposal activities in navigable waters of the United States;
- All activities that alter or modify the course, condition, location, or capacity of a navigable water of the United States;
- Construction of fixed structures and artificial islands on the outer continental shelf;
- All discharges of dredged or fill material into waters of the United States; and



FEDERAL GOVERNMENT AGENCIES

Figure 5-1

- All activities involving the transportation of dredged material for the purpose of dumping it in ocean waters (33 CFR 320.1(a)).

The Corps' "General Policies for Evaluating Permit Applications" are contained in Title 33 CFR 320.4. In exercising its permit authority, the Corps is required to undertake a public interest review of each proposed project. The basic premise of this review is that "No permit will be granted unless its issuance is found to be in the public interest." (CFR 320.4(a)). The following two passages abstracted from 33 CFR 320.4 describe the general review process and indicate the specific criteria employed in the Corps' public interest review:

> The decision whether to issue a permit will be based on an evaluation of the probable impact of the proposed structure or

work and its intended use on the public interest. Evaluation of the probable impact which the proposed structure or work may have on the public interest requires a careful weighing of all those factors which become relevant in each particular case. The benefit which reasonably may be expected to accrue from the proposal must be balanced against its reasonably foreseeable detriments. The decision whether to authorize a proposal, and if so, the conditions under which it will be allowed to occur, are therefore determined by the outcome of the general balancing process. That decision should reflect the national concern for both protection and utilization of important resources. All factors which may be relevant to the proposal must be considered. Among these are:

conservation,
economics,
aesthetics,
general environmental concerns,
historic values,
fish and wildlife values,
flood damage prevention,
land use,
navigation,
recreation,
water supply,
water quality,
energy needs,
safety,
food production, and in general,
the needs and welfare of the people.
(33 CFR 320.4(a) (1))

In reviewing permit requests, the following additional criteria are considered in the evaluation of every permit application:

- The relative extent of the public and private need for the proposed structure or work;
- The desirability of using appropriate alternative locations and methods to accomplish the objective of the proposed structure or work;
- The extent and permanence of the beneficial and/or detrimental effects which the proposed structure or work may have on the public and private uses to which the area is suited; and
- The probable impact of each proposal in relation to the cumulative effect created by other existing and anticipated structures or work in the general area (320.4(a) (2)).

Particularly relevant in the review process is the Corps' treatment of activities proposed in wetlands. Wetlands are defined by the Corps as:

> Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar area (33 CFR 320).

The public interest value accorded wetlands and the Corps' position on projects contemplated for such areas is reflected in the following policy statement:

> Wetlands are vital areas that constitute a productive and valuable public resource the unnecessary alteration or destruction of which should be discouraged as contrary to the public interest (33 CFR 320.4(b)).

Refining this position for the purposes of regulation, the Corps identifies the following set of wetland functions as important to the public interest:

- Wetlands serve important biological functions,
- Wetlands are important educational resources,
- Wetlands are a significant part of drainage basins,
- Wetlands are natural buffers which dissipate and absorb wave energy, and
- Wetlands are prime natural recharge areas.

In view of these functions, no Corps permit will be issued unless:

> ...the benefits of the proposed alteration outweigh the damage of the wetlands resource and the proposed alteration is necessary to realize those benefits. In evaluating whether a

particular alteration is necessary, the District Engineer shall consider whether the proposed activity is primarily dependent on being located in, or in close proximity to the aquatic environment and whether feasible alternative sites are available. The applicant must provide sufficient information on the need to locate the proposed activity in the wetland and must provide data on the basis of which the availability of feasible alternatives sites can be evaluated (33 CFR 320.4(4)).

Depending upon the type, magnitude, and location of a regulated activity, several forms of permit authorization are possible. These include letters of permission, individual permits, general permits, and nationwide permits.

As part of the Corps' permit application review process, interagency consultation is required. Participants in the evaluation of permit applications generally include representatives of the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the U.S. Environmental Protection Agency. Other Federal agencies are consulted as appropriate. The requirement for intergovernmental permit review is further extended to include representatives of other governmental authorities such as the State.

5.2.2 DEPARTMENT OF COMMERCE

5.2.2.1 NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

5.2.2.1.1 NATIONAL MARINE FISHERIES SERVICE

The National Marine Fisheries Service is responsible for the protection, management, and enhancement of living marine resources such as anadromous fish, marine mammals, and marine turtles. The Service's relationship with the Corps' regulatory program is expressed through its evaluation of proposed activities on marine resources By assessing the anticipated impacts of proposed projects affecting marine resources, the National Marine Fisheries Service contributes valuable information to the Corps' permit application review process.

5.2.2.1.2 OFFICE OF COASTAL ZONE MANAGEMENT

The Office of Coastal Zone Management reviews programs and distributes funds to coastal states for the planning and management of coastal areas. The Federal CZM Office reviewed and approved the Bay and Ocean Shore Segment of New Jersey's Coastal Management Program. Since 1978, New Jersey has been awarded annual program administration grants to implement its coastal zone program. Federal approval of New Jersey's Coastal Management Program carries with it the requirement that Federal and non-Federal actions be consistent with the program to the maximum extent practicable. The Corps' permit application review process adheres to this Federal consistency requirement. Corps permits for activities affecting the coastal zone can be granted only if they comply with the State's coastal management plan (see Subsection 5.3.1.1).

5.2.3 DEPARTMENT OF INTERIOR

5.2.3.1 U.S. FISH AND WILDLIFE SERVICE

The U.S. Fish and Wildlife Service provides Federal leadership in protecting, preserving, conserving and enhancing the Nation's fish and wildlife resources and their habitats for the benefit of the people. The main statutory authority of the Fish and Wildlife Service relative to permits and/or any modification to the streams and waters of the United States is the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*). The Fish and Wildlife Coordination Act requires that the Secretary of the Interior be consulted to determine the impacts on fish and wildlife resources of proposed projects. It also specifies that fish and wildlife conservation will receive equal consideration with other project features. The objectives of the Service in relation to water-related activities are to protect, preserve and enhance fish and wildlife resources.

5.2.3.2 NATIONAL PARK SERVICE

The National Park Service is vested with the authority of administering parks, monuments, and other areas of national

significance for their natural, historic, and recreational value. The National Park Service is rarely involved in the Corps' permit application review process.

5.2.3.3 HERITAGE, CONSERVATION, AND RECREATION SERVICE

The Heritage, Conservation, and Recreation Service (formerly the Bureau of Outdoor Recreation) is responsible for administering the Land and Water Conservation Fund which provides matching grants for state aquisition and development of outdoor recreation areas. Both the National Park Service and the Heritage, Conservation, and Recreation Service are involved in the Corps' permit application review process on a limited basis.

The Corps' policy with respect to scenic, historic, and recreational values is presented in 33 CFR 320.4(e):

> "Applications for permits covered by this regulation may involve areas which possess recognized historic, cultural, scenic, conservation, recreational, or similar values... Action on permit applications should, insofar as possible, avoid adverse effects on these values."

Specific application of the preceding policy is advanced to include: wild, scenic, and recreational rivers as established or proposed by the Wild and Scenic Rivers Act; historic, cultural, or archaeological sites, structures, or practices as provided for or proposed in the National Register of Historic Places; sites included in or determined eligible for listing in the National Register of Natural Landmarks; sites acquired or developed with the assistance of the Land and Water Conservation Fund; areas named as National Rivers, National Seashores, National Recreation Areas, National Lakeshores, National Parks, or National Monuments; and other public parks and recreational areas.

5.2.4 U.S. ENVIRONMENTAL PROTECTION AGENCY

The U.S. Environmental Protection Agency (EPA) has the authority and responsibility for administering the National Environmental Policy Act (NEPA) of 1969, the Clear Water Act, and the Marine Protection, Research and Sanctuaries Act of 1972. As summarized below, the administrative and regulatory functions performed under these three acts bear directly on the Corps' permit application review process.

5.2.4.1 NEPA

Section 102(2)(c) of NEPA requires all Federal agencies to submit an Environmental Impact Statement (EIS) to EPA, Washington, D.C., with respect to actions significantly affecting the quality of the human environment. An EIS is a detailed statement concerning:

- The environmental impacts of proposed activities;
- Any adverse environmental effects which cannot be avoided should the proposal be implemented;
- Alternatives to the proposed action;
- The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and
- Any irreversible and irretrievable commitments of resources which would be involved should the proposed action be implemented.

Depending upon the nature and sponsor of the activity proposed, certain permit applications may have to be accompanied by an Environmental Impact Statement. The determination of which projects require preparation of an EIS is made by the Corps' District Engineer. In cases where an EIS is deemed necessary, special permit processing procedures are followed (see 33 CFR 325.4).

5.2.4.2 CLEAN WATER ACT

The purpose of the Clean Water Act is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters. Section 404 of the Clean Water Act authorizes the Corps to establish a permit program to regulate "the discharge of dredged and fill material in all waters of the United States." The acceptability of disposal sites where such discharge may occur is established under guidelines developed jointly by the Corps and EPA. These quidelines may restrict or prohibit the use of any disposal site where it is determined that discharged materials will have an

unacceptable adverse effect on municipal water supplies, shellfish beds, fishery grounds, wildlife resources, or recreation areas (320.2(g)).

Under the provisions of Section 404, the Corps regulates all activities involving the placement of dredged or fill material in waters or wetlands of the United States. Fill material is defined as "any material used for the primary purpose of replacing an aquatic area with dry land or of changing the bottom elevation of a waterbody." (33 CFR 323.2m) The following types of activities typically require the placement of fill:

- site development for recreational, industrial, commercial, residential, and other uses;
- causeways, roadways, dams, and dikes;
- artificial islands;
- property protection and/or reclamation devices such as riprap, groins, seawalls, breakwaters, bulkheads, and fills;
- beach nourishment;
- levees;
- sanitary landfills; and
- backfill required for the placement of structures and utility lines.

5.2.4.3 MARINE PROTECTION, RESEARCH, AND SANCTUARIES ACT

The purpose of the Marine Protection, Research, and Sanctuaries Act of 1972 is to regulate activities that pollute or otherwise adversely affect ocean waters.

Section 103 of the Act creates a separate permit program administered by the Corps to regulate ocean dumping of dredged materials. Only those projects which would "not unreasonably degrade or endanger human health, welfare, or amenities, or the marine environment, ecological system, or economic potentialities" would be permitted (33 CFR 320.2(h)). Section 103 of the Marine Sanctuaries, Research, and Protection Act also establishes joint Corps-EPA guidelines and criteria for the selection of acceptable ocean disposal sites. Corps permits issued under Section 103 may be revoked by the EPA if it is determined that the ocean dumping of dredged materials "will result in an unacceptable adverse impact on municipal water supplies, shellfish beds, wildlife, fisheries, or recreation areas" (33 CFR 320.2(h)).

5.2.5 OTHER APPLICABLE FEDERAL LEGISLATION

The Federal agencies are also responsible for implementation of three Executive Orders:

- Executive Order 11990, Protection of Wetlands;
- Executive Order 11988, Floodplain Management and,
- Executive Order 11514, Protection and Enhancement of Environmental Quality;

and of the Endangered Species Act of 1973.

Section 7 of the Endangered Species Act (P.L. 93-205) states that:

> All other Federal agencies (other than Interior) shall, in connection with the assistance of the Secretary (of Interior), utilize their authorities in furtherance of the purposes of this act by carrying out programs for the conservation of endangered species and threatened species listed pursuant to Section 4 of this act. Each Federal agency shall, in consultation, with and with the assistance of the Secretary (of Interior), insure that any action authorized, funded, or carried out by such agency does not jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary (of Interior), after consultation with the affected States, to be critical, unless such agency has been granted an exemption for such action by the Committee (The Endangered Species Committee).

Section 2 of the Act continues:

> The purposes of this act are to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved, to provide a program for the conservation of such endangered species and threat-

ened species, and to take such steps as may be appropriate to achieve the purposes of the treaties and convention set forth in subsection A of this section.

The term endangered species is defined as "any species which is in danger of extinction throughout all or a significant portion of its range other than a species of the class *Insecta* determined to be a pest by the Secretary (of Interior)." The term threatened species means "any species which is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range" (Section 3 of the Act, Definitions).

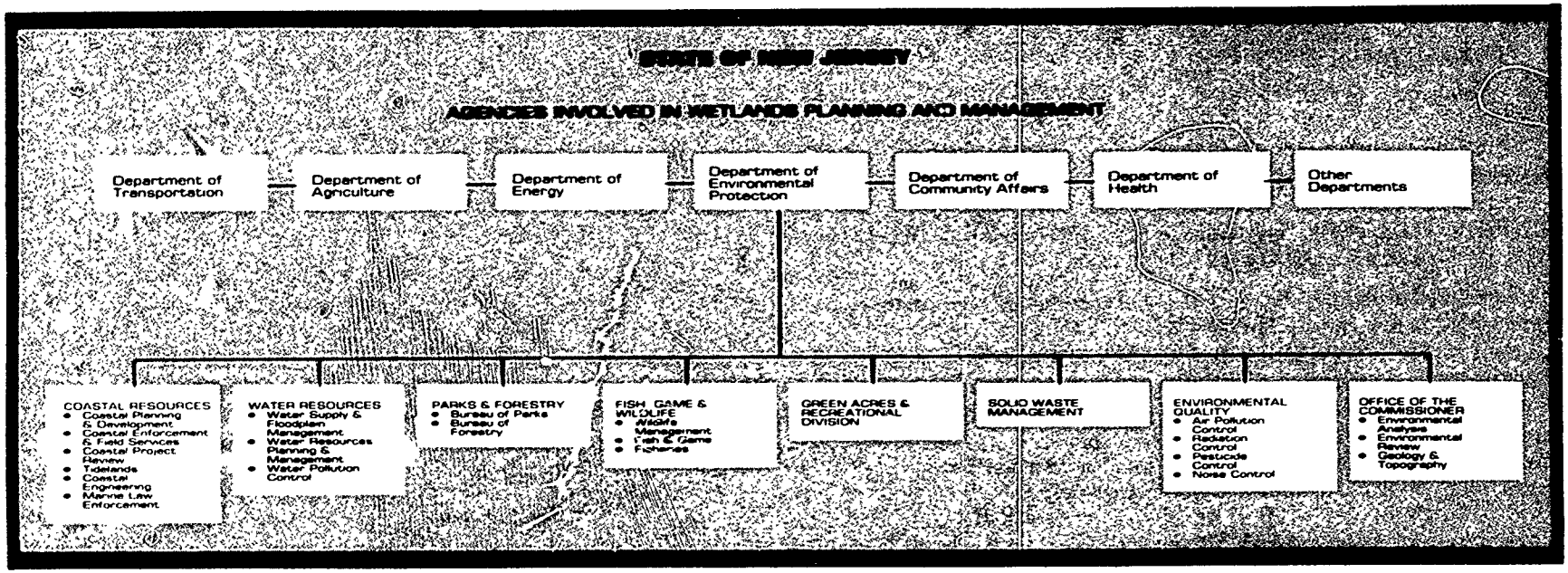
A list of the animal species designated as endangered or threatened by the Federal government is presented in the Biological Profile, Chapter 2.

5.3 STATE OF NEW JERSEY

Agencies of the State of New Jersey with responsibility either overlapping or related to the Corps' regulatory functions program are shown in Figure 5-2.

5.3.1 DEPARTMENT OF ENVIRONMENTAL PROTECTION

The New Jersey Department of Environmental Protection (NJDEP) establishes policy, regulations and enforcement proce-



STATE GOVERNMENT AGENCIES **Figure 5-2**

dures pursuant to the New Jersey Department of Environmental Protection Act of 1970 (NJSA 13:1D-1 *et seq.*). Organized into a number of offices, divisions, and bureaus, the NJDEP consolidates all state functions to insure maintenance of a quality environment. The authority and jurisdiction of NJDEP units of concern to the Corps' regulatory program are summarized below.

5.3.1.1 DIVISION OF COASTAL RESOURCES

The Division of Coastal Resources (Table 5-1) coordinates the work of six Bureaus:

- Coastal Planning and Development,
- Tidelands,
- Coastal Project Review,
- Coastal Engineering,
- Coastal Enforcement and Field Services, and
- Marine Law Enforcement.

The policies and programs of these bureaus bear an important relationship to the Corps' permit application review program.

5.3.1.1.1 BUREAU OF COASTAL PLANNING AND DEVELOPMENT

The objective of this Bureau is to provide a single planning agency for development and refinement of a decision-making program in the coastal zone and to guide development of future construction and utilization of resources within this zone. Specifically, the Bureau is charged with developing, publicizing, and revising New Jersey's Coastal Zone Management (CZM) Program. Part of this program (the Bay and Ocean Shore Segment) has been approved by the U.S. Department of Commerce.

The approved New Jersey CZM program establishes administrative rules and policy guidelines to be used in making decisions regarding the coastal zone. These rules and policies define the standards for approval, conditional approval, or denial of projects reviewed under the Coastal Area Facility Review Act (CAFRA) of 1973.

5.3.1.1.2 BUREAU OF TIDELANDS

The primary objective of the Bureau of Tidelands is to protect and manage riparian lands within the State. As defined by New Jersey Statute (NJSA 12:3-1 *et seq.*), riparian lands are properties now or formerly flowed by the tide. The mean high tide line demarcates the line between public and private ownership. Riparian lands along any tidal waterway are owned by the state.

Permission to develop or otherwise alter riparian lands must be secured through the New Jersey Tidelands Resource Council, a twelve member body of appointed citizens which makes decisions on the sale, license, or lease of State owned tidelands. Those persons desiring to develop riparian land must obtain a waterfront construction permit.

The Bureau of Tidelands serves as staff to the Tidelands Resource Council by preparing its agenda and providing market and engineering analyses of proposed projects. Types of development generally contemplated on riparian lands include dredging and filling, and the construction or alteration of docks, wharves, piers, bulkheads, bridges, pipelines, cables and similar water-related structures.

5.3.1.1.3 BUREAU OF COASTAL PROJECT REVIEW

The objective of this Bureau is to guide development within New Jersey's Coastal Zone and to implement the State's Coastal Zone Management Program. In a process similar to that of the Corps', projects requiring CAFRA, Wetlands, and Waterfront Development permits are reviewed and commented upon by this Bureau. Other projects within the coastal zone that are identified in New Jersey's Coastal Resource and Development Policies are also reviewed by this Bureau. In accordance with Section 307(c) of the Coastal Zone Management Act of 1972, applicants for Federal licenses and permits to conduct an activity affecting land or water uses in New Jersey's coastal zone must provide certification that the activity complies with the State's Coastal Zone Management Program.

CAFRA, Wetlands, and Waterfront development permits for projects proposed in the Atlantic City area are processed by the Bureau's Southern Shore Region Section.

TABLE 5-1

ORGANIZATION OF THE DIVISION OF COASTAL RESOURCES AUGUST 1979

• OFFICE OF DIRECTOR	— Includes the Office of Administration, the Bureau of Marine Law Enforcement, the offices of two Assistant Directors. One Assistant Director is responsible for Planning and Development, Enforcement and Field Services, and Project Review. The second Assistant Director coordinates activities involving Coastal Engineering and Tidelands.
— Office of Administration	
— Bureau of Marine Law Enforcement	
• BUREAU OF COASTAL PLANNING AND DEVELOPMENT	— Develops and refines New Jersey's Coastal Management Program, sponsors coastal demonstration projects, and develops coastal information system.
• BUREAU OF COASTAL PROJECT REVIEW	— Reviews CAFRA, Wetlands, and Waterfront Development Permit applications and other site-specific coastal projects.
— Northern Shore Region	
— Southern Shore Region	
— Waterfront Region	
• BUREAU OF COASTAL ENFORCEMENT AND FIELD SERVICES	— An inter-disciplinary inspection team to support functions of Tidelands and Coastal Project Review.
• BUREAU OF TIDELANDS	— Manages and protects state owned tidelands by acting as staff to the Tidelands Resource Council.
• BUREAU OF COASTAL ENGINEERING	— Protects the coastal zone from erosion and storm damage and maintains the depth and channel markings of navigable waterways.

Source: NJDEP

5.3.1.1.4 BUREAU OF COASTAL ENGINEERING

The objectives of this Bureau are to provide guidance for protection of the State's coastal zone from erosion and storm damage and to maintain the depth and channel markings of the navigable waterways of the State. To accomplish these objectives, the Bureau is engaged in the inspection, surveying, planning and design of coastal protection projects and structures. Bureau activities are presently supported by a $20 million bond issue approved by New Jersey voters in 1978.

5.3.1.1.5 BUREAU OF COASTAL ENFORCEMENT AND FIELD SERVICES

The objective of this Bureau is to provide an interdisciplinary inspection team to support the functions of the Bureaus of Tidelands and Coastal Project Review.

The Bureau investigates alleged violations of coastal laws, initiates administrative action to correct violations, inspects properties involved in coastal permit applications, monitors approved coastal projects, and provides field liaison with local building officials and the general public regarding the Division of Coastal Resources's programs and policies.

5.3.1.1.6 BUREAU OF MARINE LAW ENFORCEMENT

The Bureau of Marine Law Enforcement is responsible for the enforcement of all New Jersey laws governing boating, fishing, and marine safety. Its mandate is to protect life and property on coastal and inland waters of the State. The Bureau also investigates boating accidents, renders distress assistance, conducts search and recovery missions, and supervises the shellfish relay program.

5.3.1.2 DIVISION OF WATER RESOURCES

The Division of Water Resources is responsible for the protection and enhancement of the State's water resources. The Division issues Water Quality Certificates in accordance with Section 401 of the Clean Water Act for dredge and fill projects. Four units within the Division with functions relevant to the Corps' regulatory program are reviewed below:

5.3.1.2.1 WATER SUPPLY AND FLOODPLAIN MANAGEMENT ELEMENTS

These Elements of the Water Resources Division are jointly responsible for administering the Stream Encroachment Act of 1929 (NJSA 58:1-26 *et seq.*) and the Floodplain Act of 1972 (NJSA 58:16A-50 *et seq.*). The Stream Encroachment Act requires issuance of a Department permit before a structure may be placed channelward of the high water mark of any stream. The Floodplain Act represents a much broader piece of legislation which sets standards for various types of construction in floodplains.

5.3.1.2.2 WATER RESOURCES PLANNING AND MANAGEMENT ELEMENT

The Water Resources Planning and Management Element coordinates research and planning efforts concerned with the immediate and long-range planning of the use and conservation of the State's water resources. It also inventories land and water resources, prepares water quality plans for drainage basins and flood control plans, delineates flood hazard areas, and coordinates the Federal Flood Insurance Program in New Jersey.

5.3.1.2.3 WATER POLLUTION CONTROL, MONITORING AND SURVEILLANCE ENFORCEMENT ELEMENT

This Element administers the provisions of a series of New Jersey water laws including the Water Pollution Control Laws and Regulations of 1971, the Clean Ocean Act of 1971 (NJSA 58:10-23.25 *et seq.*), the Point Source Discharge Regulations of 1974 (NJAC 7:9-11.1 *et seq.*), and the Surface Water Quality Standards of 1974 (NJAC 7:9-4 *et seq.*). The Water Pollution Control Element establishes and revises water quality standards, administers grant programs for sewage facilities, monitors water quality, conducts environmental inventories for wastewater treatment facilities, and issues orders for the abatement of water pollution.

This Element has also been active in monitoring ocean bathing waters for pollution and in taking corrective action where cleanup has been needed. It also maintains a Shellfish Control Section which classifies and controls shellfish growing waters with regard to Federal and State water quality standards. The Office of Special

Services within this Element is responsible for the investigation of oil spills and other hazardous materials and for the enforcement of regulations regarding such spills.

5.3.1.3 DIVISION OF PARKS AND FORESTRY

Operating through two Bureaus, this Division is responsible for managing and maintaining New Jersey's parks, forests, and historic sites.

5.3.1.3.1 BUREAU OF PARKS

The Bureau of Parks is responsible for the management, administration, protection, and improvement of all state parks. The Bureau of Parks also administers the Natural Areas System Act of 1976 (N.J.S.A. 13:1B-16.4 *et seq.*) which provides statutory protection for environmentally sensitive areas owned and managed by the state. The historic sites section within the Bureau is responsible for acquiring, operating, and maintaining historic sites, structures, and districts within the State, particularly those listed in or eligible for the State or Federal Register of Historic Places. The Marina Section, also within the Bureau of Parks, is responsible for operating and maintaining the State's three marinas, one of which, the Frank Farley State Marina, is located in Atlantic City.

5.3.1.3.2 BUREAU OF FORESTRY

The Bureau of Forestry is divided into two sections involved in conservation activities. Functions relevant to wetlands include watershed protection under the Bureau's Forest Management Section and fire protection for salt marshes under the Forest Fire Service Section.

5.3.1.4 DIVISION OF FISH, GAME, AND WILDLIFE

This Division is composed of several bureaus, all of which comment on permit applications involving wetlands and/or coastal resources.

The Bureau of Marine Fisheries Management issues shellfishing permits and finfishing licenses and administers leasing grounds.

The Bureau of Wildlife Management coordinates regulatory programs with respect to hunting and fishing activities and the preservation of endangered species.

The Bureau of Law Enforcement is responsible for coordinating and enforcing the State's fish and game laws.

5.3.1.5 GREEN ACRES AND RECREATIONAL DIVISION

This Division coordinates the acquisition, development and maintenance of lands for the purposes of conservation and recreation. Supported by appropriations pursuant to the New Jersey Green Acres and Recreational Opportunities Act of 1974 (N.J.S.A. 13:8A-35 *et seq.*), the Division administer's a grant program which allocates matching funds for open space acquisition and recreational facility development. In addition, New Jersey qualifies for grants under the Federal Land and Water Conservation Fund Program. The Green Acres Division has recently updated its open space and recreation planning document, the State Comprehensive Outdoor Recreation Plan (SCORP) of 1977. SCORP qualifies New Jersey to receive grants under the Federal Land and Water Conservation Fund Program.

5.3.1.6 DIVISION OF SOLID WASTE MANAGEMENT

Acting under authority granted by the New Jersey Solid Waste Laws of 1970, this Division is responsible for the development and implementation of State, regional, and county solid waste management plans; the registration of new and existing solid waste collection and disposal facilities; and the promulgation and enforcement of rules and regulations concerning solid waste management. Regulatory provisions are specified under the Rules of the Bureau of Solid Waste Management (N.J.A.C. 7:26-1 *et seq.*).

5.3.1.7 DIVISION OF ENVIRONMENTAL QUALITY

This Division is responsible for the abatement of different types of pollution.

5.3.1.7.1 BUREAU OF AIR POLLUTION CONTROL

This Bureau administers several laws relating to air pollution control. Working in cooperation with the Federal government, the Bureau develops rules, codes and standards to regulate various direct and indirect sources of pollution. The Bureau also operates a permit and certification system for the construction and operation of all stationary sources of air pollution.

5.3.1.7.2 BUREAU OF RADIATION CONTROL

This Bureau retains jurisdiction over all matters relating to radiation. This includes identifying and evaluating hazards, registering sources, developing usage and emission standards, and conducting surveillance and compliance programs.

5.3.1.7.3 OFFICE OF PESTICIDE CONTROL

This Office is responsible for administering the New Jersey Pesticide Control Act of 1971 which restricts the use and method of application of certain pesticides.

5.3.1.7.4 OFFICE OF NOISE CONTROL

This Office establishes standards, performs monitoring, and conducts enforcement activities pursuant to the Noise Control Act of 1971 (N.J.S.A. 13:16-1 *et seq.*). Minimizing the noise disturbance associated with motorboating is part of the noise control program administered by this Office.

5.3.1.8 OFFICE OF THE COMMISSIONER

This Office coordinates the activities of all NJDEP Divisions. Three offices report directly to the Commissioner.

5.3.1.9 OFFICE OF ENVIRONMENTAL ANALYSIS

This Office is responsible for delineating the boundaries of State owned riparian lands. As such, it assists the activities of the Office of Riparian Lands Management in the Division of Marine Services.

5.3.1.10 OFFICE OF ENVIRONMENTAL REVIEW

This Office coordinates the review of Federal and State environmental impact statements as required by the National Environment Policy Act of 1969 and Executive Order No. 53, respectively. Executive Order No. 53 authorizes the DEP to identify and describe the environmental impacts associated with both State and Federally sponsored construction projects. For projects involving State funds, preparation of an EIS is required when project costs exceed $1 million or when the project location is an environmentally sensitive area. This Office does not generally review Environmental Impact Statements which fall under the jurisdiction of the Division of Coastal Resources.

5.3.1.11 BUREAU OF GEOLOGY AND TOPOGRAPHY

This Bureau maintains a data bank on soils, geology, topography, ground and surface water, and other environmental considerations. In addition, it issues licenses and permits to well drillers.

5.3.2 DEPARTMENT OF ENERGY

The Department of Energy (DOE) was established pursuant to N.J.S.A. 52-27F-1 *et seq.* The Act provides for shared authority between the DOE and DEP over all energy-related decisions in the State including those affecting the coastal zone. The policies of DOE are contained in the State Energy Master Plan which considers the production, distribution, consumption and conservation of energy in the state and surrounding region.

The major responsibilities of DOE include the formulation of energy policy, the coordination of regulations, the siting of energy facilities, and the administration of the State's Coastal Energy Impact Program (CEIP). The CEIP was created by Section 308 of the 1976 Amendments to the Federal Coastal Zone Management Act of 1972. New Jersey is eligible for financial assistance under Section 308 by virtue of its approved Coastal Zone Management Program. The objective of CEIP is to help states respond to the onshore growth impacts associated with offshore energy exploration and development. The second objective of CEIP is to balance

the sometimes conflicting national goals of increasing domestic energy supplies with protecting coastal resources.

Recognizing the importance of energy facility siting decisions in a successful coastal zone management program, New Jersey's Departments of Energy and Environmental Protection have entered into a Memorandum of Understanding (August 22, 1978). The Memorandum establishes procedures for resolving disagreements regarding energy facilities proposed in the coastal zone. The role of DOE in energy facility siting and related matters would be especially important in the Atlantic City area should marketable reserves of oil and natural gas be discovered in the Baltimore Canyon.

5.3.3 DEPARTMENT OF AGRICULTURE

Of the seven Divisions which comprise the Department of Agriculture, the most pertinent to the Corps' regulatory functions program are the Division of Rural Resources and the Soil Conservation Committee.

5.3.3.1 DIVISION OF RURAL RESOURCES

This Division provides technical assistance and carries out regulatory procedures in support of the Department's general program to preserve agricultural lands.

5.3.3.2 SOIL CONSERVATION COMMITTEE

The State Soil Conservation Committee (SCC) supports the Department's goal of preserving agricultural land. The SCC is responsible for preventing damage to farmlands by flooding and sediment loss, for conserving water for agricultural purposes, and for controlling and preventing soil erosion. Further, the Soil Erosion and Sediment Control Act of 1975 (N.J.S.A. 4:24-39 *et. seq.*) empowers the SCC to regulate development activities by setting soil and sediment control standards. Local Soil Conservation Districts are authorized to issue soil erosion control permits provided they are in compliance with State standards. The Division of Rural Resources is involved in dune stabilization in cooperation with the U.S. Soil Conservation Service.

5.3.4 DEPARTMENT OF COMMUNITY AFFAIRS

This Department coordinates several community assistance programs. Four of its divisions are relevant to the Corps' regulatory functions program.

5.3.4.1 DIVISION OF LOCAL GOVERNMENT SERVICES

This Division provides several forms of technical and financial assistance to local governments including fiscal management, legislative interpretation, and planning services.

5.3.4.2 DIVISION OF STATE AND REGIONAL PLANNING

This Division is designated as a statewide planning agency as defined by the Comprehensive Planning Assistance Program. In addition to formulating a variety of environmental policies, this Division acts as an interdepartmental clearing house for Environmental Impact Statements.

5.3.4.3 DIVISION OF HOUSING AND URBAN DEVELOPMENT

Programs administered by this Division include housing inspection, neighborhood preservation, relocation assistance, low and medium income apartment mortgaging, and provision of advice on Federal housing programs.

5.3.4.4 DIVISION OF HUMAN RESOURCES

This Division offers a variety of community development programs providing technical and financial assistance to county and local offices with respect to aging, youth, employment, continuing education, and legal advice.

5.3.5 DEPARTMENT OF HEALTH

This Department performs several functions which are directly related to pollution control. As guardians of the public's health and

safety, local health officials are authorized to inspect, regulate, and, if necessary, condemn various facilities and activities with respect to health standards established at the State level. Health Department approval is required for the creation or alteration of water supply and sewerage systems.

5.3.6 DEPARTMENT OF TRANSPORTATION

The Department of Transportation (DOT) is organized into 14 divisions and 63 bureaus. It provides and regulates various forms of transportation service inlcuding railroad, highway, subway, bus line, and aeronautic systems. Of the DOT's many functions, three are particularly noteworthy in regard to the Corps' permit program: road and/or transit siting, establishing modal funding priorities, and permitting transportation related activities. The latter function refers to DOT's extensive regulatory powers which require the issuance of permits for more than 25 types of roadway and roadway border construction activities. Types of improvements requiring DOT permits include utility openings, access driveways, drainage, bridge attachments, curbs and sidewalks, crossovers, detours, railway crossings, removal of fill, guardrail removal, grading, and landscaping.

5.3.7 CASINO CONTROL COMMISSION

The Casino Control Commission, established in 1977, has jurisdiction over the licensing of the hotel/casino complexes which are the focal point of the renewal of Atlantic City. Though the Commission does not investigate potential wetland incursions, it does seek assurance from applicants that all necessary government permits have been secured. The Commission's position is that it will not approve hotel/casinos that are not located in areas zoned for hotel/casinos in Atlantic City's Master Plan. This limits the location of hotel/casinos to three areas: the Boardwalk area, the marina area, and a commercially zoned area near the eastern end of the Atlantic City Expressway.

5.4 THE COUNTY ROLE

5.4.1 ATLANTIC COUNTY DIVISION OF PLANNING

The Atlantic County Division of Planning is vested with no regulatory authority, and thus, performs in an advisory capacity. Its advisory role is formally expressed in its review of site plans and subdivision proposals at the local level, of permit applications at the State level, and of grants-in-aid at the Federal level. This review function is not supported by a formally adopted master plan. The absence of a comprehensive policy statement precludes the County from establishing a formal position on the acceptability of wetland development.

5.5 THE LOCAL ROLE

5.5.1 APPLICABLE LAWS AND REGULATIONS

Primary elements of the local regulatory system generally include a master plan, zoning ordinance and map, subdivision regulations, site plan review ordinances, and building codes. Authorities responsible for implementing these provisions include planning boards, zoning boards, and building inspectors. Whereas local authorities are vested with either the administrative status to formulate policy or the regulatory power to issue permits and licenses, certain other units of local government serve in an advisory capacity. Their review role is exemplified by such citizen advisory committees as the Conservation Commission. Authorized by the Municipal Conservation Committee Act (N.J.S.A. 40:56A-(*et seq.*), Conservation Commissions make recommendations to the local planning process with respect to resource management; air, water and noise pollution control; and soil and landscape protection.

Refer to Volume I, Chapter I, Section 1.6.7.5, Zoning and Future Plans, for a discussion of Atlantic City's planning program.